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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

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(57) [Claim(s)]
[Claim 1] The connecting piping used with the refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant is reused. It is refrigerating cycle equipment equipped with the 1st refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through a heat-source side heat exchanger, a flow regulator, and a use side heat exchanger one by one from a compressor. Between the above-mentioned use side heat exchanger and the above-mentioned compressor Refrigerating cycle equipment characterized by having a foreign matter prehension means to catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed.
[Claim 2] The connecting piping used with the refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant is reused. It is refrigerating cycle equipment equipped with the 1st refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through a heat-souce side heat exchanger, a flow regulator, a use side heat exchanger, and an accumulator one by one from a compressor. Refrigerating cycle equipment characterized by having a foreign matter prehension means to catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed, between the above-mentioned use side heat exchanger and the above-mentioned accumulator.
[Claim 3] The connecting piping used with the refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant is reused. It is refrigerating cycle equipment equipped with the 1st refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through a heat-souce side heat exchanger, a flow regulator, a use side heat exchanger, and an accumulator one by one from a compressor. Refrigerating cycle equipment characterized by having the 1st bypass way which has a foreign matter prehension means to catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed while bypassing the refrigerant circuit between the above-mentioned use side heat exchanger and the above-mentioned accumulator.
[Claim 4] Refrigerating cycle equipment according to claim 3 characterized by having had the 2nd bypass way which has the cooling means of a refrigerant, and equipping the upstream of the above-mentioned foreign matter prehension means of the above-mentioned 1st bypass way with the heating means of a refrigerant further while bypassing the refrigerant circuit between the above-mentioned heat-souce side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned flow regulator.
[Claim 5] Refrigerating cycle equipment according to claim 4 characterized by having equipped the upstream of

the above-mentioned heating means of the above-mentioned 1st bypass way with the 1st flow rate control means, and equipping the downstream of the above-mentioned cooling means with the above-mentioned 2nd bypass way with the 2nd flow rate control means further.

[Claim 6] Refrigerating cycle equipment according to claim 1 to 5 characterized by having an oil-separation means to separate the oil component of a refrigerant between the above-mentioned compressor of the 1st refrigerant circuit of the above, and the above-mentioned heat-souce side heat exchanger.

[Claim 7] Refrigerating cycle equipment according to claim 3 characterized by having the 3rd bypass way which has an oil-separation means to separate the oil component of a refrigerant while bypassing the refrigerant circuit between the above-mentioned heat-souce side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned flow regulator.

[Claim 8] Refrigerating cycle equipment according to claim 4 characterized by having an oil-separation means to divide the oil component of a refrigerant into the upstream of the above-mentioned cooling means of the above-mentioned 2nd bypass way.

[Claim 9] The 1st refrigerant circuit which the connecting piping used with the refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant is reused [refrigerant circuit], and makes the above-mentioned compressor circulate through a HFC refrigerant through a heat-souce side heat exchanger, a flow regulator, and a use side heat exchanger one by one from a compressor The 2nd refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through the above-mentioned use side heat exchanger, the above-mentioned flow regulator, and the above-mentioned heat-souce side heat exchanger one by one from the above-mentioned compressor It is refrigerating cycle equipment equipped with the above, and is characterized by having a foreign matter prehension means to catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed, between the above-mentioned heat-souce side heat exchanger of the 2nd refrigerant circuit of the above, and the above-mentioned compressor, while the above-mentioned use side heat exchanger and the above-mentioned compressor of the 1st refrigerant circuit of the above.

[Claim 10] The 1st refrigerant circuit which the connecting piping used with the refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant is reused [refrigerant circuit], and makes the above-mentioned compressor circulate through a HFC refrigerant through a heat-souce side heat exchanger, a flow regulator, a use side heat exchanger, and an accumulator one by one from a compressor The 2nd refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through the above-mentioned use side heat exchanger, the above-mentioned flow regulator, the above-mentioned heat-souce side heat exchanger, and the above-mentioned accumulator one by one from the above-mentioned compressor It is refrigerating cycle equipment equipped with the above, and is characterized by having a foreign matter prehension means to catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed, between the above-mentioned heat-souce side heat exchanger of the 2nd refrigerant circuit of the above, and the above-mentioned accumulator, while the above-mentioned use side heat exchanger and the above-mentioned accumulator of the 1st refrigerant circuit of the above.

[Claim 11] The 1st refrigerant circuit which the connecting piping used with the refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant is reused [refrigerant circuit], and makes the above-mentioned compressor circulate through a HFC refrigerant through a heat-souce side heat exchanger, a flow regulator, a use side heat exchanger, and an accumulator one by one from a compressor The 2nd refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through the above-mentioned use side heat exchanger, the above-mentioned flow regulator, the above-mentioned heat-souce side heat exchanger, and the above-mentioned accumulator one by one from the above-mentioned compressor It is refrigerating cycle equipment equipped with the above, and while bypass the refrigerant circuit between the above-mentioned use side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned accumulator and bypassing the refrigerant circuit between the above-mentioned above-mentioned flow regulator of the 2nd refrigerant circuit of the above, and the above-mentioned heat-souce side heat exchanger, it carries out having had the 1st bypass way which has a foreign matter prehension means catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed as the description.

[Claim 12] Refrigerating cycle equipment according to claim 11 characterized by providing or including the following The 2nd bypass way which has the cooling means of a refrigerant while bypassing the refrigerant circuit between the above-mentioned heat-souce side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned flow regulator and bypassing the refrigerant circuit between the above-mentioned compressor of the 2nd refrigerant circuit of the above, and the above-mentioned use side heat

exchanger Furthermore, it is the heating means of a refrigerant to the upstream of the above-mentioned foreign matter prehension means of the above-mentioned 1st bypass way.
[Claim 13] Refrigerating cycle equipment according to claim 12 characterized by having equipped the upstream of the above-mentioned heating means of the above-mentioned 1st bypass way with the 1st flow rate control means, and equipping the downstream of the above-mentioned cooling means of the above-mentioned 2nd bypass way with the 2nd flow rate control means further.
[Claim 14] Refrigerating cycle equipment according to claim 9 to 13 characterized by having an oil-separation means to separate the oil component of a refrigerant between the above-mentioned compressor of the 2nd refrigerant circuit of the above, and the above-mentioned use side heat exchanger while the above-mentioned compressor of the 1st refrigerant circuit of the above, and the above-mentioned heat-souce side heat exchanger.
[Claim 15] Refrigerating cycle equipment according to claim 12 characterized by having an oil-separation means to separate the oil component of a refrigerant between the above-mentioned compressor of the 2nd refrigerant circuit of the above, and the above-mentioned cooling means while the above-mentioned compressor of the 1st refrigerant circuit of the above, and the above-mentioned heat-souce side heat exchanger.
[Claim 16] Refrigerating cycle equipment according to claim 11 characterized by having the 3rd bypass way which has an oil-separation means to separate the oil component of a refrigerant while bypassing the refrigerant circuit between the above-mentioned heat-souce side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned flow regulator and bypassing the refrigerant circuit between the above-mentioned compressor of the 2nd refrigerant circuit of the above, and the above-mentioned use side heat exchanger.
[Claim 17] Refrigerating cycle equipment according to claim 12 characterized by having an oil-separation means to divide the oil component of a refrigerant into the upstream of the above-mentioned cooling means of the above-mentioned 2nd bypass way.
[Claim 18] Refrigerating cycle equipment according to claim 1 to 17 characterized by having the interior unit bypass way which can carry out by-pass control of the above-mentioned flow regulator and the above-mentioned use side heat exchanger.
[Claim 19] Claims 7-8 characterized by having the reflux way which returns the oil component separated by the above-mentioned oil-separation means to the above-mentioned accumulator by the downstream from the above-mentioned foreign matter prehension means, refrigerating cycle equipment given in either 14-17.
[Claim 20] Refrigerating cycle equipment according to claim 5 or 12 characterized by having a mineral oil impregnation means to pour in mineral oil at the downstream of the above-mentioned oil-separation means of the above-mentioned 2nd bypass way at a refrigerant.
[Claim 21] Refrigerating cycle equipment according to claim 5 or 12 characterized by having a water impregnation means to pour in water at the downstream of the above-mentioned oil-separation means of the above-mentioned 2nd bypass way at a refrigerant.
[Claim 22] Refrigerating cycle equipment according to claim 21 characterized by equipping the above-mentioned refrigerant circuit with a water adsorption means to adsorb the moisture in a refrigerant.
[Claim 23] The above-mentioned foreign matter prehension means is refrigerating cycle equipment according to claim 1 to 17 characterized by reducing the rate of flow of a refrigerant in a part of above-mentioned refrigerant circuit, and making it separate the foreign matter in a refrigerant.
[Claim 24] The above-mentioned foreign matter prehension means is refrigerating cycle equipment according to claim 1 to 17 characterized by catching the foreign matter in a refrigerant by letting a refrigerant pass in mineral oil.
[Claim 25] The above-mentioned foreign matter prehension means is refrigerating cycle equipment according to claim 1 to 17 characterized by making it dissolve CFC and HCFC in a refrigerant by letting a refrigerant pass in mineral oil.
[Claim 26] The above-mentioned foreign matter prehension means is refrigerating cycle equipment according to claim 1 to 16 characterized by catching the foreign matter in a refrigerant by letting a refrigerant pass in a filter.
[Claim 27] The above-mentioned foreign matter prehension means is refrigerating cycle equipment according to claim 1 to 17 characterized by catching the chlorine ion in a refrigerant by letting a refrigerant pass on ion exchange resin.
[Claim 28] Refrigerating cycle equipment given in either of claims 3, 4, 7, 11, 12, and 16 characterized by preparing the above-mentioned 1st bypass way, the 2nd bypass way, or the 3rd bypass way free [separation] from the above-mentioned refrigerant circuit.

[Claim 29] Refrigerating cycle equipment characterized by providing the following Heat souce which has a compressor side and heat-souce si[redacted]eat exchanger and an accumulator TH[redacted]reign matter prehension means which is refrigerating cycle equipment which uses the HFC refrigerant which was equipped with the interior unit which has a flow regulator and a use side heat exchanger, reused the 1st connecting piping and 2nd connecting piping which were being used with the CFC refrigerant or the HCFC refrigerant, and connected heat souce and an interior unit by the 1st connecting piping of the above, and the 2nd connecting piping, and carries out the prehension <U> of the mineral oil which remains to the 1st connecting piping of the above, and the 2nd connecting piping out of the above-mentioned HFC refrigerant which flowed

[Claim 30] Refrigerating cycle equipment characterized by providing the following Heat souce which has a compressor side and heat-souce side heat exchanger and an accumulator A foreign matter prehension means catch the solid foreign matter and the liquid foreign matter which are refrigerating cycle equipment which uses the HFC refrigerant which was equipped with the interior unit which has a flow regulator and a use side heat exchanger, reused the 1st connecting piping and 2nd connecting piping which was being used with the CFC refrigerant or the HCFC refrigerant, and connected heat souce and an interior unit by the 1st connecting piping of the above, and the 2nd connecting piping, and remain to the 1st connecting piping of the above, and the 2nd connecting piping out of the above-mentioned HFC refrigerant which has flowed

[Claim 31] Refrigerating cycle equipment characterized by providing the following Heat souce which has a compressor side and heat-souce side heat exchanger and an accumulator A foreign matter prehension means catch the residual foreign matter which is refrigerating cycle equipment which uses the HFC refrigerant which was equipped with the interior unit which has a flow regulator and a use side heat exchanger, reused the 1st connecting piping and 2nd connecting piping which were being used with the CFC refrigerant or the HCFC refrigerant, and connected heat souce and an interior unit by the 1st connecting piping of the above, and the 2nd connecting piping, and remains to the 1st connecting piping of the above, and the 2nd connecting piping out of the above-mentioned HFC refrigerant which has flowed

[Claim 32] In existing refrigerating cycle equipment have the following and using a <1st refrigerant> CFC refrigerant or a HCFC refrigerant While permuting the above-mentioned compressor, the above-mentioned heat-souce side heat exchanger, the above-mentioned flow regulator, the above-mentioned use side heat exchanger, and the above-mentioned accumulator by the thing using a <2nd refrigerant> HFC refrigerant The formation approach of the refrigerating cycle equipment characterized by forming refrigerating cycle equipment according to claim 1 to 31 using the existing refrigerant piping connected to the above-mentioned flow regulator and the above-mentioned use side heat exchanger. The 1st refrigerant circuit which makes the above-mentioned compressor circulate through a refrigerant through a heat-souce side heat exchanger, a flow regulator, a use side heat exchanger, and an accumulator one by one from a compressor The 2nd refrigerant circuit which makes the above-mentioned compressor circulate through a refrigerant through the above-mentioned use side heat exchanger, the above-mentioned flow regulator, the above-mentioned heat-souce side heat exchanger, and the above-mentioned accumulator one by one from the above-mentioned compressor

[Claim 33] The exterior unit of the refrigerating cycle equipment characterized by providing the following A compressor and the exterior unit containing a heat-source side heat exchanger A foreign matter prehension means catch the residual foreign matter which remained for the 1st piping of the above, and the 2nd piping out of the above-mentioned HFC refrigerant which has flowed for refrigerant piping built in this exterior unit in the exterior unit of the refrigerating cycle equipment which connects and constitutes the interior unit containing a flow regulator and a use side heat exchanger from the 1st piping and 2nd piping which was being used with the CFC refrigerant or the HCFC refrigerant

[Claim 34] The exterior unit of the refrigerating cycle equipment characterized by providing the following The exterior unit containing a compressor, a four way valve, and a heat-source side heat exchanger A foreign matter prehension means catch the residual foreign matter which remained for the 1st piping of the above, and the 2nd piping at refrigerant piping between the above-mentioned four way valve and the above-mentioned compressor out of the above-mentioned HFC refrigerant which has flowed in the exterior unit of the refrigerating cycle equipment which connects and constitutes the interior unit containing a flow regulator and a use side heat exchanger from the 1st piping and 2nd piping which were being used with the CFC refrigerant or the HCFC refrigerant

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to exchange of the refrigerant of refrigerating cycle equipment. In more detail, only heat souce and an interior unit are exchanged newly, and it is related with the refrigerating cycle equipment for which a refrigerant is exchanged newly, its exchange approach, and an operating method without exchanging the connecting piping which connects heat souce and an interior unit.
[0002]
[Description of the Prior Art] The conditioner of a separate form generally used from the former is shown in drawing 11 . In drawing 11 , A is heat souce and builds in a compressor 1, a four way valve 2, the heat-souce side heat exchanger 3, the 1st actuation valve 4, the 2nd actuation valve 7, and an accumulator 8. B is an interior unit and is equipped with the flow regulator 5 (or flow control valve 5) and the use side heat exchanger 6. It is installed in the distant location, the 1st connecting piping C and the 2nd connecting piping D connect, and heat souce A and an interior unit B form a refrigerating cycle.
[0003] The end of the 1st connecting piping C is connected with the heat-souce side heat exchanger 3 through the 1st actuation valve 4, and other ends of the 1st connecting piping C are connected with the flow regulator 5. The end of the 2nd connecting piping D is connected through a four way valve 2 and the 2nd actuation valve 7, and other ends of the 2nd connecting piping D are connected with the use side heat exchanger 6. Moreover, oil returning hole 8a is prepared in the lower part of outflow piping of the shape of a U tube of an accumulator 8.
[0004] The flow of the refrigerant of this conditioner is accompanied and explained to drawing 11 . A continuous-line arrow head shows the flow of a broken-line arrow head's heating operation of the flow of air conditioning operation among drawing. First, the flow of air conditioning operation is explained. Through a four way valve 2, the gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 flows into the heat-souce side heat exchanger 3, and heat exchange of it is carried out to heat-source media, such as air and water, here, and it is condensate-ized. The condensate-ized refrigerant flows into a flow regulator 5 through the 1st actuation valve 4 and the 1st connecting piping C, is decompressed to low voltage here, will be in a low voltage two phase condition, and by the use side heat exchanger 6, heat exchange of it is carried out to use side media, such as air, and it is evaporative-gas-ized. The evaporative-gas-ized refrigerant returns to a compressor 1 through the 2nd connecting piping D, the 2nd actuation valve 7, a four way valve 2, and an accumulator 8.
[0005] Next, the flow of heating operation is explained. Through a four way valve 2, the 2nd actuation valve 7, and the 2nd connecting piping D, the gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 flows into the use side side heat exchanger 6, and the heat exchanger of it is carried out to use side media, such as air, here, and it is condensate-ized. The condensate-ized refrigerant flows into a flow regulator 5, is decompressed to low voltage here, will be in a low voltage two phase condition, and through the 1st connecting piping C and the 1st actuation valve 4, by the heat-souce side heat exchanger 3, heat exchange of it is carried out to heat-source media, such as air and water, and it is evaporative-gas-ized. The evaporative-gas-ized refrigerant returns to a compressor 1 through a four way valve 2 and an accumulator 8.
[0006] Conventionally, as a refrigerant of such an air conditioning system, although CFC (chlorofluorocarbon) and HCFC (hydrochlorofluorocarbon) have been used, in order that the chlorine contained in these molecules may destroy an ozone layer in a stratosphere, CFC is already abolished and production regulation is started also for HCFC.
[0007] These are replaced and the conditioner which uses HFC (hydro fluorocarbon) which does not contain chlorine in a molecule is put in practical use. When the conditioner using CFC or HCFC is superannuated, since abolition / production regulation is carried out, it is necessary to change these refrigerants to the conditioner using HFC. Since heat souce A and an interior unit B are superannuated, it is necessary to exchange them, and since the refrigerating machine oil, organic material, and heat exchanger used by HFC differ from HCFC, it

is necessary to exchange for the thing only for HFC and, and exchange of the heat souce A and the interior unit B for CFC-HCFC is also comp[redacted]vely easy the interior unit from the fi[redacted]
[0008] It is difficult to exchange for new piping, when laid under the buildings, such as a case where the 1st connecting piping C which, on the other hand, connects heat souce A and an interior unit B, and the 2nd connecting piping D have long piping length, a pipe shaft, and the underpart of the roof, and piping work can be simplified if the 1st connecting piping C which was being used with the conditioner using CFC or HCFC and the 2nd connecting piping D can be used as it is, since superannuation moreover is not carried out, either.
[0009] However, to the 1st connecting piping C which was being used with the conditioner using CFC or HCFC, and the 2nd connecting piping D, that from which the degradation object of mineral oil, CFC-HCFC, or refrigerating machine oil which is refrigerating machine oil of the conditioner which used CFC and HCFC became a sludge remains.
[0010] Drawing 12 is drawing showing the critical solubility which shows the solubility of the refrigerating machine oil for HFC at the time of mineral oil mixing, and a HFC refrigerant (R407C), an axis of abscissa shows oil quantity (wt%), and an axis of ordinate shows temperature (degree C). Since the refrigerating machine oil for HFC dissociates and floats after liquid cooling mediating when compatibility with a HFC refrigerant is lost and the accumulator 8 is covered with liquid cooling intermediation as shown in drawing 12 if mineral oil mixes in the refrigerating machine oil (synthetic oil, such as ester oil and an ether oil) of the conditioner using HFC more than a constant rate, refrigerating machine oil does not return from oil returning hole 8a in the lower part of an accumulator 8 to a compressor, but the sliding section of a compressor is burned. Moreover, mixing of mineral oil degrades the refrigerating machine oil for HFC. Moreover, mixing of CFC-HCFC degrades the refrigerating machine oil for HFC by the chlorine component contained in these. Moreover, the refrigerating machine oil for HFC deteriorates by the chlorine component contained in that from which the degradation object of the refrigerating machine oil for CFC-HCFC became a sludge.
[0011] For this reason, washing conventionally the 1st connecting piping C which was being used with the conditioner which used CFC and HCFC, and the 2nd connecting piping D by the penetrant remover (HCFC141b and HCFC225) of dedication using a washing station is performed (this is hereafter called the washing approach 1). Moreover, there is an approach indicated by JP,7-83545,A. As shown in drawing 13 , this, without using a washing station The heat souce A for HFC The interior unit B for HFC, the 1st connecting piping C, and the 2nd connecting piping D are connected (step 100). It washes by operating, after being filled up with the refrigerating machine oil for HFC and HFC (step 101) (step 102). After collecting the refrigerants and refrigerating machine oil in a conditioner after that and being filled up with a new refrigerant and refrigerating machine oil (step 103) What is repeated the number of predetermined times (steps 104 and 105) is proposed [carrying out washing by operation again, and] (this is hereafter called the washing approach 2).
[0012]
[Problem(s) to be Solved by the Invention] There was a problem as shown below by the above-mentioned conventional washing approach 1. The penetrant remover used for the 1st is HCFC, and since ozone depletion potential is not zero, it is contradictory to substituting for the refrigerant of a conditioner from HCFC to HFC. Ozone modulus of rupture is as large as 0.11, and especially HCFC141b is a problem.
[0013] It is raised that inflammability and toxicity are not completely safe for the penetrant remover used for the 2nd. HCFC141b is inflammability and is low toxicity. It is low toxicity although HCFC225 is nonflammable. The boiling point is high (HCFC141b is 32 degrees C and HCFC225 is 51.1-56.1 degrees C), and when an OAT is lower than this boiling point, in winter, a penetrant remover is especially liquefied voice after washing, and it remains [3rd] to the 1st connecting piping C and the 2nd connecting piping D. Since these penetrant removers are HCFC(s), the chlorine component is included and the refrigerating machine oil for HFC deteriorates.
[0014] A penetrant remover requires [4th] the time and effort of washing construction -- hot nitrogen gas etc. re-washes so that it is necessary to carry out environment top whole-quantity recovery and and the 3rd trouble of the above may not occur.
[0015] Moreover, there was a problem as shown below by the above-mentioned conventional washing approach 2. Washing by the HFC refrigerant is required for it 3 times in the example of JP,7-83545,A, and since the HFC refrigerant used by each washing operation contains an impurity in the 1st, to it, reuse on the spot after recovery is impossible. That is, a 3 times as many refrigerant as the usual amount of restoration refrigerants is required, and they are cost and an environment top problem.
[0016] In order to also replace [2nd] refrigerating machine oil after each washing operation, 3 times as much refrigerating machine oil as the usual amount of restoration refrigerating machine oil is required, and they are cost and an environment top problem. Moreover, the refrigerating machine oil for HFC is ester oil or an ether oil, and since hygroscopicity is high, moisture management of the refrigerating machine oil for exchange is also

needed. Moreover, since human being who washes encloses refrigerating machine oil, there is a danger that excess and deficiency will arise and [illegible] may be caused in subsequent op[illegible]on (the compression zone destruction by oil compression and motor overheating are caused at the time of overestimation, and poor lubrication is caused at the time of insufficient restoration).

[0017] This invention was made in order to solve the above conventional technical problems, and it tends to offer the refrigerating cycle equipment which permutes the established refrigerating cycle equipment using the refrigerant which is a environmental protection top problem, and it is supposed that it is by the refrigerant made for there to be no environmental protection top problem, and its permutation approach and operating method.

[0018]

[Means for Solving the Problem] The refrigerating cycle equipment by invention of claim 1 of this application The connecting piping used with the refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant is reused. It is refrigerating cycle equipment equipped with the 1st refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through a heat-source side heat exchanger, a flow regulator, and a use side heat exchanger one by one from a compressor. Between the above-mentioned use side heat exchanger and the above-mentioned compressor It is characterized by having a foreign matter prehension means to catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed. The refrigerating cycle equipment by invention of claim 2 of this application The connecting piping used with the refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant is reused. It is refrigerating cycle equipment equipped with the 1st refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through a heat-souce side heat exchanger, a flow regulator, a use side heat exchanger, and an accumulator one by one from a compressor. It is characterized by having a foreign matter prehension means to catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed, between the above-mentioned use side heat exchanger and the above-mentioned accumulator.

[0019] The refrigerating cycle equipment by invention of claim 3 reuses the connecting piping used with the refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant. It is refrigerating cycle equipment equipped with the 1st refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through a heat-souce side heat exchanger, a flow regulator, a use side heat exchanger, and an accumulator one by one from a compressor. While bypassing the refrigerant circuit between the above-mentioned use side heat exchanger and the above-mentioned accumulator, it is characterized by having the 1st bypass way which has a foreign matter prehension means to catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed.

[0020] The refrigerating cycle equipment by invention of claim 4 is characterized by having had the 2nd bypass way which has the cooling means of a refrigerant, and equipping the upstream of the above-mentioned foreign matter prehension means of the above-mentioned 1st bypass way with the heating means of a refrigerant further while it bypasses the refrigerant circuit between the above-mentioned heat-souce side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned flow regulator.

[0021] The refrigerating cycle equipment by invention of claim 5 is characterized by having equipped the upstream of the above-mentioned heating means of the above-mentioned 1st bypass way with the 1st flow rate control means, and equipping the downstream of the above-mentioned cooling means of the above-mentioned 2nd bypass way with the 2nd flow rate control means further.

[0022]

[0023]

[0024] The refrigerating cycle equipment by invention of claim 6 is characterized by having an oil-separation means to separate the oil component of a refrigerant between the above-mentioned compressor of the 1st refrigerant circuit of the above, and the above-mentioned heat-souce side heat exchanger.

[0025] The refrigerating cycle equipment by invention of claim 7 is characterized by having the 3rd bypass way which has an oil-separation means to separate the oil component of a refrigerant while it bypasses the refrigerant circuit between the above-mentioned heat-souce side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned flow regulator.

[0026] The refrigerating cycle equipment by invention of claim 8 is characterized by having an oil-separation means to divide the oil component of a refrigerant into the upstream of the above-mentioned cooling means of the above-mentioned 2nd bypass way.

[0027] The refrigerating cycle equipment by invention of claim 9 reuses the connecting piping used with the

refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant. The 1st refrigerant circuit which makes the above-mentioned compr[illegible]r circulate through a HFC refrigerant [illegible]ugh a heat-souce side heat exchanger, a flow regulator, and a use side heat exchanger one by one from a compressor, It is refrigerating cycle equipment equipped with the 2nd refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through the above-mentioned use side heat exchanger, the above-mentioned flow regulator, and the above-mentioned heat-souce side heat exchanger one by one from the above-mentioned compressor. Between the above-mentioned use side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned compressor, and between the above-mentioned heat-souce side heat exchanger of the 2nd refrigerant circuit of the above, and the above-mentioned compressor It is characterized by having a foreign matter prehension means to catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed. The refrigerating cycle equipment by invention of claim 10 The connecting piping used with the refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant is reused. The 1st refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through a heat-souce side heat exchanger, a flow regulator, a use side heat exchanger, and an accumulator one by one from a compressor, It is refrigerating cycle equipment equipped with the 2nd refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through the above-mentioned use side heat exchanger, the above-mentioned flow regulator, the above-mentioned heat-souce side heat exchanger, and the above-mentioned accumulator one by one from the above-mentioned compressor. Between the above-mentioned use side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned accumulator And it is characterized by having a foreign matter prehension means to catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed, between the above-mentioned heat-souce side heat exchanger of the 2nd refrigerant circuit of the above, and the above-mentioned accumulator.

[0028] The refrigerating cycle equipment by invention of claim 11 The connecting piping used with the refrigerating cycle equipment of a CFC refrigerant or a HCFC refrigerant is reused. The 1st refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through a heat-souce side heat exchanger, a flow regulator, a use side heat exchanger, and an accumulator one by one from a compressor, It is refrigerating cycle equipment equipped with the 2nd refrigerant circuit which makes the above-mentioned compressor circulate through a HFC refrigerant through the above-mentioned use side heat exchanger, the above-mentioned flow regulator, the above-mentioned heat-souce side heat exchanger, and the above-mentioned accumulator one by one from the above-mentioned compressor. While bypassing the refrigerant circuit between the above-mentioned use side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned accumulator and bypassing the refrigerant circuit between the above-mentioned above-mentioned flow regulator of the 2nd refrigerant circuit of the above, and the above-mentioned heat-souce side heat exchanger It is characterized by having the 1st bypass way which has a foreign matter prehension means to catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned HFC refrigerant which has flowed.

[0029] The refrigerating cycle equipment by invention of claim 12 While bypassing the refrigerant circuit between the above-mentioned heat-souce side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned flow regulator and bypassing the refrigerant circuit between the above-mentioned compressor of the 2nd refrigerant circuit of the above, and the above-mentioned use side heat exchanger It is characterized by having had the 2nd bypass way which has the cooling means of a refrigerant, and equipping the upstream of the above-mentioned foreign matter prehension means of the above-mentioned 1st bypass way with the heating means of a refrigerant further.

[0030] The refrigerating cycle equipment by invention of claim 13 is characterized by having equipped the upstream of the above-mentioned heating means of the above-mentioned 1st bypass way with the 1st flow rate control means, and equipping the downstream of the above-mentioned cooling means of the above-mentioned 2nd bypass way with the 2nd flow rate control means further.

[0031]

[0032]

[0033] The refrigerating cycle equipment by invention of claim 14 is characterized by having an oil-separation means to separate the oil component of a refrigerant between the above-mentioned compressor of the 2nd refrigerant circuit of the above, and the above-mentioned use side heat exchanger, while the above-mentioned compressor of the 1st refrigerant circuit of the above, and the above-mentioned heat-souce side heat exchanger.

[0034] The refrigerating cycle equipment by invention of claim 15 is characterized by having an oil-separation

means to separate the oil component of a refrigerant between the above-mentioned compressor of the 2nd refrigerant circuit of the above, and [redacted] above-mentioned cooling means, whi[redacted]e above-mentioned compressor of the 1st refrigerant circuit of the above, and the above-mentioned heat-souce side heat exchanger.

[0035] The refrigerating cycle equipment by invention of claim 16 is characterized by having the 3rd bypass way which has an oil-separation means to separate the oil component of a refrigerant while it bypasses the refrigerant circuit between the above-mentioned heat-souce side heat exchanger of the 1st refrigerant circuit of the above, and the above-mentioned flow regulator and bypasses the refrigerant circuit between the above-mentioned compressor of the 2nd refrigerant circuit of the above, and the above-mentioned use side heat exchanger.

[0036] The refrigerating cycle equipment by invention of claim 17 is characterized by having an oil-separation means to divide the oil component of a refrigerant into the upstream of the above-mentioned cooling means of the above-mentioned 2nd bypass way.

[0037] The refrigerating cycle equipment by invention of claim 18 is characterized by having the interior unit bypass way which can carry out by-pass control of the above-mentioned flow regulator and the above-mentioned use side heat exchanger.

[0038] The refrigerating cycle equipment by invention of claim 19 is characterized by having the reflux way which returns the oil component separated by the above-mentioned oil-separation means to the above-mentioned accumulator by the downstream from the above-mentioned foreign matter prehension means.

[0039] The refrigerating cycle equipment by invention of claim 20 is characterized by having a mineral oil impregnation means to pour in mineral oil at the downstream of the above-mentioned oil-separation means of the above-mentioned 2nd bypass way at a refrigerant.

[0040] The refrigerating cycle equipment by invention of claim 21 is characterized by having a water impregnation means to pour in water at the downstream of the above-mentioned oil-separation means of the above-mentioned 2nd bypass way at a refrigerant.

[0041] The refrigerating cycle equipment by invention of claim 22 is characterized by equipping the above-mentioned refrigerant circuit with a water adsorption means to adsorb the moisture in a refrigerant.

[0042] The refrigerating cycle equipment by invention of claim 23 is characterized by the above-mentioned foreign matter prehension means reducing the rate of flow of a refrigerant in a part of above-mentioned refrigerant circuit, and making it separate the foreign matter in a refrigerant.

[0043] The refrigerating cycle equipment by invention of claim 24 is characterized by the above-mentioned foreign matter prehension means catching the foreign matter in a refrigerant by letting a refrigerant pass in mineral oil.

[0044] It is characterized by making it the refrigerating cycle equipment by invention of claim 25 dissolve CFC and HCFC in a refrigerant, when the above-mentioned foreign matter prehension means lets a refrigerant pass in mineral oil.

[0045] The refrigerating cycle equipment by invention of claim 26 is characterized by the above-mentioned foreign matter prehension means catching the foreign matter in a refrigerant by letting a refrigerant pass in a filter.

[0046] The refrigerating cycle equipment by invention of claim 27 is characterized by the above-mentioned foreign matter prehension means catching the chlorine ion in a refrigerant by letting a refrigerant pass on ion exchange resin.

[0047] The refrigerating cycle equipment by invention of claim 28 is characterized by preparing the above-mentioned 1st bypass way, the 2nd bypass way, or the 3rd bypass way free [separation] from the above-mentioned refrigerant circuit.

[0048] The refrigerating cycle equipment by invention of claim 29 The heat souce which has a compressor side and heat-souce side heat exchanger and an accumulator, and a flow regulator, Have the interior unit which has a use side heat exchanger, and the 1st connecting piping and 2nd connecting piping which were being used with the CFC refrigerant or the HCFC refrigerant are reused. It is refrigerating cycle equipment which uses the HFC refrigerant which connected heat souce and an interior unit by the 1st connecting piping of the above, and the 2nd connecting piping. It is characterized by having a foreign matter prehension means to catch the mineral oil which remains to the 1st connecting piping of the above, and the 2nd connecting piping out of the above-mentioned HFC refrigerant which has flowed. The refrigerating cycle equipment by invention of claim 30 The heat souce which has a compressor side and heat-souce side heat exchanger and an accumulator, and a flow regulator, Have the interior unit which has a use side heat exchanger, and the 1st connecting piping and 2nd connecting piping which were being used with the CFC refrigerant or the HCFC refrigerant are reused. It is refrigerating cycle equipment which uses the HFC refrigerant which connected heat souce and an interior unit

by the 1st connecting piping of the above, and the 2nd connecting piping. It is characterized by having a foreign matter prehension means to catch t[illegible]olid foreign matter and liquid foreign m[illegible]er which remain to the 1st connecting piping of the above, and the 2nd connecting piping out of the above-mentioned HFC refrigerant which has flowed. The refrigerating cycle equipment by invention of claim 31 The heat souce which has a compressor side and heat-souce side heat exchanger and an accumulator, and a flow regulator, Have the interior unit which has a use side heat exchanger, and the 1st connecting piping and 2nd connecting piping which were being used with the CFC refrigerant or the HCFC refrigerant are reused. It is refrigerating cycle equipment which uses the HFC refrigerant which connected heat souce and an interior unit by the 1st connecting piping of the above, and the 2nd connecting piping. It is characterized by having a foreign matter prehension means to catch the residual foreign matter which remains to the 1st connecting piping of the above, and the 2nd connecting piping out of the above-mentioned HFC refrigerant which has flowed. [0049] Moreover, the formation approach of the refrigerating cycle equipment by invention of claim 32 The 1st refrigerant circuit which makes the above-mentioned compressor circulate through a refrigerant through a heat-souce side heat exchanger, a flow regulator, a use side heat exchanger, and an accumulator one by one from a compressor, It has the 2nd refrigerant circuit which makes the above-mentioned compressor circulate through a refrigerant through the above-mentioned use side heat exchanger, the above-mentioned flow regulator, the above-mentioned heat-souce side heat exchanger, and the above-mentioned accumulator one by one from the above-mentioned compressor. In the existing refrigerating cycle equipment using a CFC refrigerant or a HCFC refrigerant, while permuting the above-mentioned compressor, the above-mentioned heat-souce side heat exchanger, the above-mentioned flow regulator, the above-mentioned use side heat exchanger, and the above-mentioned accumulator by the thing using a HFC refrigerant It is characterized by forming refrigerating cycle equipment according to claim 1 to 31 using the existing refrigerant piping connected to the above-mentioned flow regulator and the above-mentioned use side heat exchanger.
[0050]
[0051] Moreover, the exterior unit of the refrigerating cycle equipment by invention of claim 34 is characterized by to equip refrigerant piping built in this exterior unit with a foreign matter prehension means catch the residual foreign matter which remained to the above-mentioned connecting piping out of the above-mentioned CFC refrigerant which has flowed in the exterior unit of the refrigerating cycle equipment which connects and constitutes a compressor, the exterior unit containing a heat-source side heat exchanger, and the interior unit containing a flow regulator and a use side heat exchanger from refrigerant piping.
[0052] Moreover, the exterior unit of the refrigerating cycle equipment by invention of claim 35 In the exterior unit of the refrigerating cycle equipment which connects and constitutes a compressor, a four way valve, the exterior unit containing a heat-source side heat exchanger, and the interior unit containing a flow regulator and a use side heat exchanger from refrigerant piping Suppose that it is characterized by having a foreign matter prehension means to capture prehension **** out of the above-mentioned CFC refrigerant which has flowed into the above-mentioned refrigerant piping between the above-mentioned four way valve and the above-mentioned compressor the residual foreign matter which remained to the above-mentioned connecting piping.
[0053]
[0054]
[0055]
[0056]
[0057]
[0058]
[0059]
[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained with reference to a drawing. In addition, among each drawing, the same sign is given to the same or a corresponding part, and explanation is omitted or simplified into it.
Gestalt 1. drawing 1 of operation is drawing showing the refrigerant circuit of a conditioner as an example of the refrigerating cycle equipment by the gestalt 1 of implementation of this invention. In drawing 1 , A is heat souce and builds in a compressor 1, a four way valve 2, the heat-souce side heat exchanger 3, the 1st actuation valve 4, the 2nd actuation valve 7, the accumulator 8, the oil separator 9 (oil-separation means), and the foreign matter prehension means 13.
[0060] An oil separator 9 is formed in regurgitation piping of a compressor 1, and the refrigerating machine oil breathed out with a refrigerant is separated from a compressor 1. The foreign matter prehension means 13 is established between the four way valve 2 and the accumulator 8. 9a is a bypass way which stems from the pars basilaris ossis occipitalis of an oil separator 9, and results in the downstream from the outlet of the foreign matter prehension means 13. Moreover, oil returning hole 8a is prepared in the lower part of outflow

piping of the shape of a U tube of an accumulator 8. B is an interior unit and is equipped with the flow regulator 5 (or flow control valve 5) [redacted] the use side heat exchanger 6. [redacted]
[0061] C is the 1st connecting piping, the end is connected with the heat-souce side heat exchanger 3 through the 1st actuation valve 4, and other ends are connected with the flow regulator 5. D is the 2nd connecting piping, the end is connected through a four way valve 2 and the 2nd actuation valve 7, and other ends are connected with the use side heat exchanger 6. It is installed in the distant location, the 1st connecting piping C and the 2nd connecting piping D connect, and heat souce A and an interior unit B form a refrigerating cycle. In addition, this conditioner uses HFC as a refrigerant.
[0062] Next, the procedure of conditioner exchange when the conditioner using CFC or HCFC is superannuated is shown. CFC or HCFC(s) are collected and it exchanges for what shows heat souce A and an interior unit B to drawing 1 . The 1st connecting piping C and the 2nd connecting piping D reuse the thing of the conditioner using HCFC. Since heat souce A is beforehand filled up with HFC, closed, the 1st actuation valve 4 and the 2nd actuation valve 7 carry out vacuum suction for an interior unit B, the 1st connecting piping C, and the 2nd connecting piping D in the state of connection, and carry out the 1st actuation valve 4, valve opening of the 2nd actuation valve 7, and additional restoration of HFC after that. Then, the usual washing [air-conditioning operation-cum-] operation is carried out.
[0063] Next, the contents of the usual washing [air-conditioning operation-cum-] operation are accompanied and explained to drawing 1 . A drawing solid line arrow head shows the flow of a broken-line arrow head's heating operation of the flow of air conditioning operation. Air conditioning operation is explained first. With the refrigerating machine oil for HFC, the gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 has a compressor 1 breathed out, and flows into an oil separator 9.
[0064] Here, it dissociates completely, and through a four way valve 2, it flows into the heat-souce side heat exchanger 3, and only a gas refrigerant carries out the heat exchanger of the refrigerating machine oil for HFC to heat-source media, such as air and water, here, and condensate-izes it. The condensate-ized refrigerant flows into the 1st connecting piping C through the 1st actuation valve 4. When liquid cooling intermediation of HFC flows the 1st connecting piping C, CFC-HCFC, the mineral oil, and the mineral oil degradation object (a residual foreign matter is called below) which remains to the 1st connecting piping C are washed little by little, and it flows with liquid cooling intermediation of HFC, and flows into a flow regulator 5, it decompresses to low voltage here and will be in a low voltage two phase condition, and by the use side heat exchanger 6, heat exchange is carried out to use side media, such as air, and it evaporative-gas-izes.
[0065] The evaporative-gas-ized refrigerant flows into the 2nd connecting piping D with the residual foreign matter of the 1st connecting piping C. Although some residual foreign matters adhering to a piping inside become Myst-like and it flows in a gas refrigerant since the refrigerant with which the residual foreign matter which remains to the 2nd connecting piping flows this is a gas Although washing time amount is later than the 1st connecting piping C in order that most liquefied residual foreign matters may flow a piping inside annularly in the form dragged by the gas refrigerant according to the shearing force which is the rate of flow later than the rate of flow of a gas refrigerant, and is generated in gas and a liquid interface, it is washed certainly.
[0066] Then, a gas refrigerant flows into the foreign matter prehension means 13 through the 2nd actuation valve 7 and a four way valve 2 with the residual foreign matter of the 1st connecting piping C, and the residual foreign matter of the 2nd connecting piping D. A phase changes with differences in the boiling point, and a residual foreign matter is classified into three kinds such as a solid-state foreign matter, a liquid foreign matter, and a gas foreign matter. With the foreign matter prehension means 13, a solid-state foreign matter and a liquid foreign matter are completely separated and caught with a gas refrigerant. As for a gas foreign matter, the part is caught, and a part is not caught. The blasting-fumes refrigerant returns to a compressor 1 through an accumulator 8 with the gas foreign matter which was not caught with the foreign matter prehension means 13. In addition, let the refrigerant circuit at the time of air conditioning operation, i.e., the refrigerant circuit which returns from a compressor 1 to a compressor 1 again through the heat-souce side heat exchanger 3, a flow regulator 5, the use side heat exchanger 6, and an accumulator 8 one by one, be the 1st refrigerant circuit on these specifications.
[0067] Since a gas refrigerant and the refrigerating machine oil for HFC separated completely join a main stream on the lower stream of a river of the foreign matter prehension means 13 and returns to a compressor 1 through bypass way 9a with an oil separator 9, it is not mixed with the mineral oil which remained to the 1st connecting piping C and the 2nd connecting piping D, and the refrigerating machine oil for HFC is not made immiscible to HFC, and the refrigerating machine oil for HFC does not deteriorate with mineral oil.
[0068] Moreover, a solid foreign matter is not mixed with the refrigerating machine oil for HFC, either, and the refrigerating machine oil for HFC does not deteriorate. Moreover, although a part is only caught and the refrigerating machine oil for HFC and a gas foreign matter are mixed while a HFC refrigerant circulates through

one cycle of refrigerant circuits and a gas foreign matter passes along the foreign matter prehension means 13 once, degradation of the refrigerating machine oil for HFC is a chemical reaction and does not progress rapidly. The example is shown in drawing 2 . Drawing 2 is drawing showing time amount change of degradation when chlorine is mixing (175 degrees C) in the refrigerating machine oil for HFC, an axis of abscissa shows time amount (hr), and an axis of ordinate shows the total acid number (mgKOH/g). since the gas foreign matter which was not caught while passing along the foreign matter prehension means 13 once passes along the foreign matter prehension means 13 repeatedly with circulation of a HFC refrigerant -- the refrigerating machine oil for HFC -- deteriorating -- rather than -- quick -- the foreign matter prehension means 13 -- catching -- ****ing .

[0069] Next, the flow of heating operation is explained. With the refrigerating machine oil for HFC, the gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 has a compressor 1 breathed out, and flows into an oil separator 9. Here, the refrigerating machine oil for HFC is separated completely, and only a gas refrigerant flows into the 2nd connecting piping D through a four way valve 2 and the 2nd actuation valve 7.

[0070] Although some residual foreign matters adhering to a piping inside become Myst-like and it flows in a gas refrigerant since the refrigerant with which the residual foreign matter which remains to the 2nd connecting piping flows this is a gas Although washing time amount is later than the 1st connecting piping C at the time of air conditioning operation in order that most liquefied residual foreign matters may flow a piping inside annularly in the form dragged by the gas refrigerant according to the shearing force which is the rate of flow later than the rate of flow of a gas refrigerant, and is generated in gas and a liquid interface, it is washed certainly.

[0071] Then, with the residual foreign matter of the 2nd connecting piping D, a gas refrigerant flows into the use side side heat exchanger 6, and heat exchange of it is carried out to use side media, such as air, here, and it is condensate-ized. The condensate-ized refrigerant flows into a flow regulator 5, it is decompressed to low voltage here, will be in a low voltage two phase condition, and will flow into the 1st connecting piping C. For a vapor-liquid two phase condition, the rate of flow is also quick, and with liquid cooling intermediation, a residual foreign matter is washed and is washed at a rate quicker than the 1st connecting piping at the time of air conditioning operation.

[0072] Through the 1st actuation valve 4, by the heat-souce side heat exchanger 3, heat exchange of the refrigerant of a vapor-liquid two phase condition is carried out to heat-source media, such as air and water, and it is evaporative-gas-ized with the residual foreign matter washed from the 2nd connecting piping D and the 1st connecting piping C. The evaporative-gas-ized refrigerant flows into the foreign matter prehension means 13 through a four way valve 2.

[0073] A phase changes with differences in the boiling point, and a residual foreign matter is classified into three kinds such as a solid-state foreign matter, a liquid foreign matter, and a gas foreign matter. With the foreign matter prehension means 13, a solid-state foreign matter and a liquid foreign matter are completely separated and caught with a gas refrigerant. As for a gas foreign matter, the part is caught, and a part is not caught. Then, a gas refrigerant returns to a compressor 1 through an accumulator 8 with the gas foreign matter which was not caught with the foreign matter prehension means 13. In addition, let the refrigerant circuit at the time of heating operation, i.e., the refrigerant circuit which returns from a compressor 1 to a compressor 1 again through the use side heat exchanger 6, a flow regulator 5, the heat-souce side heat exchanger 3, and an accumulator 8 one by one, be the 2nd refrigerant circuit on these specifications.

[0074] Since a gas refrigerant and the refrigerating machine oil for HFC separated completely join a main stream on the lower stream of a river of the foreign matter prehension means 13 and returns to a compressor 1 through bypass way 9a with an oil separator 9, it is not mixed with the mineral oil which remained to the 1st connecting piping C and the 2nd connecting piping D, and the refrigerating machine oil for HFC is not made immiscible to HFC, and the refrigerating machine oil for HFC does not deteriorate with mineral oil.

[0075] Moreover, a solid foreign matter is not mixed with the refrigerating machine oil for HFC, either, and the refrigerating machine oil for HFC does not deteriorate. Moreover, although a part is only caught and the refrigerating machine oil for HFC and a gas foreign matter are mixed while a HFC refrigerant circulates through one cycle of refrigerant circuits and a gas foreign matter passes along the foreign matter prehension means 13 once, degradation of the refrigerating machine oil for HFC is a chemical reaction, and does not progress rapidly. The example is shown in drawing 2 . since the gas foreign matter which was not caught while passing along the foreign matter prehension means 13 once passes along the foreign matter prehension means 13 repeatedly with circulation of a HFC refrigerant -- the refrigerating machine oil for HFC -- deteriorating -- rather than -- quick -- the foreign matter prehension means 13 -- catching -- ****ing .

[0076] Next, an example of the foreign matter prehension means 13 is explained. Drawing 3 illustrates an

example of the foreign matter prehension means 13. Outflow piping for which 51 was prepared in the cylinder-like container and 52 was prepared in the upper part of a container 51, The filter with which 53 was formed and installed by the up inside of a container 51 at the flabellate form conic side-face configuration, The mineral oil with which the container 51 is beforehand filled up with 54, inflow piping for which 55 was prepared in the lower side face of a container 51, and 55a are the outflow holes established in the piping side face of the part in the interior of the container 51 of the inflow piping 55. [many]

[0077] A filter 53 is also that of the shape of a mesh which knit the thin line and was crowded, or is formed with a sintered metal, and each clearance is dozens of microns from several microns, and it cannot pass the solid-state foreign matter beyond this. Moreover, if the liquid foreign matter of the shape of Myst which may recognize minute amount existence also tends to pass a filter 53 to the up space of a container 51, it will be caught here, it will flow in the direction of a container side face with gravity, and will fall in the lower part of a container 51. 56 is ion exchange resin which catches a chlorine ion. In drawing 1 , the inflow piping 55 is connected to the accumulator 8 for the outflow piping 52 through ion exchange resin 56 at the four way valve 2.

[0078] Through outflow hole 55a, the gas refrigerant which flowed from the inflow piping 55 becomes bubble-like, passes through the inside of mineral oil 54, and flows out from the outflow piping 52 through a filter 53 and ion exchange resin 56. From the inflow piping 55, from outflow hole 55a, mineral oil 54 is resisting after an outflow, a rate falls into mineral oil 54, and the solid-state foreign matter which flowed with the gas refrigerant precipitates at the pars basilaris ossis occipitalis of a container 51 with gravity. Moreover, if the cross section of a container 51 is larger than the cross section of the inflow piping 55 and it goes into the interior of a container 51, even if there is no mineral oil 54, since the rate of flow of a refrigerant (gas) will fall, it is separated by operation of gravity with a refrigerant (gas), and an individual foreign matter precipitates in the lower part of a container 51. Moreover, even if the gas flow rate in the inside of mineral oil 54 should be large and a solid-state foreign matter should be pressured upwards to the upper part of mineral oil 54, it is caught with a filter 53.

[0079] Mineral oil 54 is resisting after an outflow into mineral oil 54, a rate falls, vapor liquid separation of the liquid foreign matter which flowed with the gas refrigerant from the inflow piping 55 is carried out by outflow hole 55a, and it piles up with mineral oil 54 from it. Moreover, if the cross section of a container 51 is larger than the cross section of the inflow piping 55 and it goes into the interior of a container 51, even if there is no mineral oil 54, since the rate of flow of a refrigerant (gas) will fall, it is separated by operation of gravity with a refrigerant (gas), and a liquid foreign matter piles up in the lower part of a container 51. Even if the gas flow rate in the inside of mineral oil 54 is large, the oil level of mineral oil 54 is confused, mineral oil becomes Myst-like and it rides the flow of a gas refrigerant, it is caught with a filter 53, is caught as mentioned above here, it flows in the direction of a side face of a container 51 with gravity, and falls in the lower part of a container 51.

[0080] Through outflow hole 55a, the gas foreign matter which flowed with the gas refrigerant from the inflow piping 55 becomes bubble-like, passes through the inside of mineral oil 54, and flows out from the outflow piping 52 through a filter 53 and ion exchange resin 56. Although the principal component in a gas foreign matter is CFC or HCFC, these are dissolved in mineral oil 54. An example is shown in drawing 4 . It is drawing in which drawing 4 (a) shows the solubility of mineral oil and CFC, and drawing 4 (b) shows the solubility of mineral oil and HCFC. In drawing, an axis of abscissa is temperature (degree C), an axis of ordinate is the pressure (kg/cm2) of CFC or HCFC, and solubility is shown by making concentration (wt%) of CFC or HCFC into a parameter.

[0081] From the inflow piping 55, through outflow hole 55a, the gas foreign matter which flowed with the gas refrigerant is becoming bubble-like about the inside of mineral oil 54, and its contact to mineral oil 54 increases, and it dissolves CFC and HCFC in mineral oil 54 more certainly. However, since HFC is not dissolved in mineral oil, all flow out of the outflow piping 52. Thus, a solid-state foreign matter and a liquid foreign matter are completely separated and caught inside a container 51. Moreover, most is dissolved and caught while CFC and HCFC which are the principal component of a gas foreign matter also pass this part several times.

[0082] Moreover, since it melts into the water with which a minute amount exists all over a refrigerant circuit and exists as a chlorine ion, chlorine components other than CFC in a residual foreign matter or HCFC are caught by passing ion exchange resin 56 several times.

[0083] Next, an oil separator 9 is explained. There are some which were shown in JP,5-19721,Y as an example of a high performance oil separator. The internal structure Fig. is shown in drawing 5 . The well-closed container which has the circular idiosoma from which 71 is constituted by upper shell 71a and bottom shell 71b, and 72 are inlet pipes which have a reticulum 73 at a tip, and an inlet pipe 72 penetrates the abbreviation center section of upper shell 71a, and is projected and attached in the container 71. Circular ******

constituted by the punching metal which has many stomata by which 78 was prepared in the upper part of a reticulum 73, and 79 are up space formed in the upper part of ****** 78, and become refrigerant outflow space. The outlet pipe to which 74 has an edge in the refrigerant outflow space 79, and 77 are return oil pipes.

[0084] The oil separator of 100% of separation efficiency can be obtained by connecting two or more such high performance oil separators to a serial. The rate of flow of a gas refrigerant and the experimental result of separation efficiency in the oil separator of the structure of drawing 5 are shown in drawing 6 . In drawing, an axis of abscissa shows the mean velocity (m/s) in a container, and an axis of ordinate shows separation efficiency (%). In the refrigerating machine oil generally breathed out from a compressor 1 in the bore of the oil separator of the beginning of a serial oil separator by making it the maximum rate of flow become 0.13 or less m/s, for the reason not more than 1.5wt%, refrigerating machine oil is less than [0.05wt%] by refrigerant flow rate by refrigerant flow rate at the secondary of the first oil separator.

[0085] Since the flow pattern of the vapor-liquid two-phases flow of a gas refrigerant and refrigerating machine oil serves as a spraying style, refrigerating machine oil is completely separable with this ratio by also carrying out the 2nd oil separator to more than the diameter of said, and making eyes, such as a sintered metal, very fine for the mesh of inflow piping. Thus, it is possible to realize the oil separator of 100% of separation efficiency by the dimension of the existing oil separator or combining more than one, and the oil separator 9 shown in drawing 1 is such.

[0086] As mentioned above, the conditioner using superannuated CFC or superannuated HCFC can be changed to the conditioner using new HFC without exchanging heat souce A and an interior unit B newly and exchanging the 1st connecting piping C and the 2nd connecting piping D by building an oil separator 9 and the foreign matter prehension means 13 in heat souce A. According to such an approach, there is also no need of there being no possibility of ozone layer depletion, and there being also inflammability and no toxicity, and there being also no concern of a penetrant remover residual, and collecting penetrant removers as the established piping reuse approach since it does not carry out it being different in the conventional washing approach 1, and washing by the penetrant remover (HCFC141b and HCFC225) of dedication using a washing station.

[0087] Moreover, since it is necessary to repeat washing operation 3 times and to replace neither a HFC refrigerant nor HFC refrigerating machine oil 3 times unlike the conventional washing approach 2, since required HFC and refrigerating machine oil can be managed with one set, they are advantageous on cost and an environment. Moreover, management of the refrigerating machine oil for exchange is also unnecessary, and the danger of refrigerating-machine-oil excess and deficiency is not generated at all, either. Moreover, there is also no fear of immiscible-izing of the refrigerating machine oil for HFC or degradation of refrigerating machine oil.

[0088] Although the gestalt of this operation explained the example to which one interior unit B was connected, it cannot be overemphasized that the same effectiveness is done so also with the conditioner by which two or more interior units B were connected to juxtaposition or a serial. Moreover, even if the ice thermal storage tub and the water heat storage tank (a molten bath is included) are installed in the heat-souce side heat exchanger 3, a serial, or juxtaposition, it is clear to do the same effectiveness so. Moreover, it is clear that heat souce A does the same effectiveness so also in the conditioner connected to two or more set juxtaposition. Moreover, it is the refrigerating cycle application article of not only a conditioner but a steamy compression equation, and if the unit in which the heat-souce side heat exchanger was built, and the unit in which the use side heat exchanger was built separate and are installed, it is clear to do the same effectiveness so.

[0089] Gestalt 2. drawing 7 of operation is drawing showing the refrigerant circuit of a conditioner as an example of the refrigerating cycle equipment by the gestalt 2 of implementation of this invention. In drawing 7 , since sign B-D, 1-9, and 8a and 9a are the same as that of the gestalt 1 of operation, they omit detailed explanation.

[0090] Next, a cooling means (cooling system) by which 12a cools and liquefies the gas refrigerant of elevated-temperature high pressure, a heating means (heating apparatus) by which 12b gasifies a low voltage two phase refrigerant, and 13 are the foreign matter prehension means (foreign matter prehension equipment) formed in the outlet section of the above-mentioned heating means 12b at the serial. The 1st solenoid valve with which 14a was prepared in the outlet section of the above-mentioned foreign matter prehension means 13, and 14b are the 2nd solenoid valve formed in the inlet-port section of the above-mentioned heating means 12b.

[0091] 10 is the 1st change-over valve and performs the following connection change-overs according to operation mode among four places, the outlet edge at the time of air conditioning operation of the heat-souce side heat exchanger 3, the outlet edge at the time of heating operation of a four way valve 2, the inlet-port edge of the above-mentioned cooling means 12a, and the outlet edge of the above-mentioned solenoid-valve

14a. That is, at the time of air conditioning washing operation, the outlet edge at the time of air conditioning operation of the heat-souce side heat exchanger 3 and the inlet-port edge of cooling means 12a are connected, and the outlet edge of solenoid-valve 14a and the inlet-port edge at the time of air conditioning operation of a four way valve 2 (outlet edge at the time of heating operation) are connected. Moreover, at the time of heating washing operation, the outlet edge at the time of heating operation of a four way valve 2 and the inlet-port edge of cooling means 12a are connected, and the outlet edge of solenoid-valve 14a and the inlet-port edge at the time of heating operation of the heat-souce side heat exchanger 3 (outlet edge at the time of air conditioning operation) are connected.

[0092] 11 is the 2nd change-over valve. At the time of air conditioning washing operation and air conditioning usual operation The outlet edge of cooling means 12a is connected to the 1st actuation valve 4. At the time of heating washing operation and heating usual operation The outlet edge of cooling means 12a is connected to the 2nd actuation valve 7, and the inlet-port edge of solenoid-valve 12b is connected to the 2nd actuation valve 7 at the time of air conditioning washing operation, and the inlet-port edge of solenoid-valve 12b is connected to the 1st actuation valve 4 at the time of heating washing operation. 14c is the 3rd solenoid valve and is the solenoid valve formed in the middle of piping which connects between the end connection to the heat-souce side heat exchanger 3 of the 1st change-over valve 10, and the end connections to the 1st actuation valve 4 of the 2nd change-over valve 11. 14d is the 4th solenoid valve and is the solenoid valve formed in the middle of piping which connects between the end connection to the four way valve 2 of the 1st change-over valve 10, and the end connections to the 2nd actuation valve 7 of the 2nd change-over valve 11.

[0093] Check valve 10a prepared so that it might not permit the reverse, although the 1st change-over valve 10 of the above permits circulation of the refrigerant from an outlet edge to the inlet-port edge of cooling means 12a at the time of air conditioning operation of the heat-souce side heat exchanger 3, Check valve 10b prepared so that the reverse might not be permitted, although circulation of the refrigerant from an outlet edge to the inlet-port edge of cooling means 12a at the time of heating operation of a four way valve 2 is permitted, Check valve 10c prepared so that the reverse might not be permitted, although circulation of the refrigerant from an outlet edge to the outlet edge at the time of air conditioning operation of the heat-souce side heat exchanger 3 of 1st solenoid-valve 14a is permitted, although circulation of the refrigerant from an outlet edge to the outlet edge at the time of heating operation of a four way valve 2 of 1st solenoid-valve 14a is permitted, since the reverse consists of 10d of check valves prepared so that it might not approve -- an electrical signal -- not depending -- the pressure of each end connection -- self -- it is a switchable change-over valve.

[0094] Any of air and water are sufficient as the source of cooling of the above-mentioned cooling means 12a, and any of air and water or a heater is sufficient also as the source of heating of the above-mentioned heating means 12b. Moreover, it is possible for cooling means 12a and heating means 12b to contact thermally piping of the elevated-temperature high-tension side and piping of the low-temperature low-tension side which were inserted into the 1st change-over valve 10 and 2nd change-over valve 11, for example, to constitute from piping of the low-temperature low-tension side as piping of the elevated-temperature high-tension side and inside piping as outside piping of a double pipe. That is, heat transfer may be carried out between heating means 12b and cooling means 12a.

[0095] By the above configurations, heat souce A builds in bypass way 9a of an oil separator 9 and a separation oil, cooling means 12a, heating means 12b, the foreign matter prehension means 13, the 1st change-over valve 10, the 2nd change-over valve 11, the 1st solenoid-valve the 14a, the 2nd solenoid-valve 14b, the 3rd solenoid-valve 14c, and the 14d of the 4th solenoid valve. In addition, let a refrigerant circuit part including heating means 12b and the foreign matter prehension means 13 be the 1st bypass way on these specifications. Moreover, let the refrigerant circuit part containing cooling means 12a be the 2nd bypass way on these specifications. In addition, this conditioner uses HFC as a refrigerant again.

[0096] Next, the procedure of conditioner exchange when the conditioner using CFC or HCFC is superannuated is shown. CFC or HCFC(s) are collected and it exchanges for what shows heat souce A and an interior unit B to drawing 7 . The 1st connecting piping C and the 2nd connecting piping D reuse the thing of the conditioner using HCFC. Since heat souce A is beforehand filled up with HFC, closed, the 1st actuation valve 4 and the 2nd actuation valve 7 carry out vacuum suction for an interior unit B, the 1st connecting piping C, and the 2nd connecting piping D in the state of connection, and carry out the 1st actuation valve 4, valve opening of the 2nd actuation valve 7, and additional restoration of HFC after that. Then, washing operation is carried out first and after that usual air-conditioning operation is carried out.

[0097] Next, the contents of washing operation are accompanied and explained to drawing 7 . A continuous-line arrow head shows the flow of air conditioning washing operation among drawing, and a broken-line arrow head shows the flow of heating washing operation. Air conditioning washing operation is explained first. With the refrigerating machine oil for HFC, the gas refrigerant of elevated-temperature high pressure compressed

with the compressor 1 has a compressor 1 breathed out, and flows into an oil separator 9. Here, it dissociates completely, and through a four way valve 2, only a gas refrigerant flows into the heat-souce side heat exchanger 3, carries out the heat exchanger of the refrigerating machine oil for HFC to heat-source media, such as air and water, here, and condensate-izes it to some extent.

[0098] The refrigerant condensate-ized to some extent flows into cooling means 12a through the 1st change-over valve 10, is condensate-ized completely here and flows into the 1st connecting piping C through the 2nd change-over valve 11 and the 1st actuation valve 4. When liquid cooling intermediation of HFC flows the 1st connecting piping C, CFC-HCFC, the mineral oil, and the mineral oil degradation object (a residual foreign matter is called below) which remains to the 1st connecting piping C are washed little by little, and it flows with liquid cooling intermediation of HFC, and flows into a flow regulator 5, it decompresses to low voltage here and will be in a low voltage two phase condition, and by the use side heat exchanger 6, heat exchange is carried out to use side media, such as air, and it evaporative-gas-izes to some extent.

[0099] The refrigerant of the vapor-liquid two phase condition evaporative-gas-ized to some extent flows into the 2nd connecting piping D with the residual foreign matter of the 1st connecting piping C. Since the refrigerant which flows this is in a vapor-liquid two phase condition, the rate of flow of the residual foreign matter which remains to the 2nd connecting piping D is also quick, and with liquid cooling intermediation, a residual foreign matter is washed and is washed at a rate quicker than the 1st connecting piping C.

[0100] Then, with the residual foreign matter of the 1st connecting piping C, and the residual foreign matter of the 2nd connecting piping D, through the 2nd actuation valve 7, the 2nd change-over valve 11, and solenoid-valve 14of ** 2nd b, the refrigerant of the vapor-liquid two phase condition evaporative-gas-ized to some extent flows into heating means 12b, is evaporated and gasified completely here, and flows into the foreign matter prehension means 13. A phase changes with differences in the boiling point, and a residual foreign matter is classified into three kinds such as a solid-state foreign matter, a liquid foreign matter, and a gas foreign matter. With the foreign matter prehension means 13, a solid-state foreign matter and a liquid foreign matter are completely separated and caught with a gas refrigerant.

[0101] As for a gas foreign matter, the part is caught, and a part is not caught. The blasting-fumes refrigerant returns to a compressor 1 through the 1st solenoid-valve 14a, the 1st change-over valve 10, a four way valve 2, and an accumulator 8 with the gas foreign matter which was not caught with the foreign matter prehension means 13. Since a gas refrigerant and the refrigerating machine oil for HFC separated completely join a main stream on the lower stream of a river of the foreign matter prehension means 13 and returns to a compressor 1 through bypass way 9a with an oil separator 9, it is not mixed with the mineral oil which remained to the 1st connecting piping C and the 2nd connecting piping D, and the refrigerating machine oil for HFC is not made immiscible to HFC, and the refrigerating machine oil for HFC does not deteriorate with mineral oil.

[0102] Moreover, a solid foreign matter is not mixed with the refrigerating machine oil for HFC, either, and the refrigerating machine oil for HFC does not deteriorate. Moreover, although a part is only caught and the refrigerating machine oil for HFC and a gas foreign matter are mixed while a HFC refrigerant circulates through one cycle of refrigerant circuits and a gas foreign matter passes along the foreign matter prehension means 13 once, degradation of the refrigerating machine oil for HFC is a chemical reaction, and does not progress rapidly. The example is shown in drawing 2 . since the gas foreign matter which was not caught while passing along the foreign matter prehension means 13 once passes along the foreign matter prehension means 13 repeatedly with circulation of a HFC refrigerant -- the refrigerating machine oil for HFC -- deteriorating -- rather than -- quick -- the foreign matter prehension means 13 -- catching -- ****ing .

[0103] Next, the flow of heating washing operation is explained. With the refrigerating machine oil for HFC, the gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 has a compressor 1 breathed out, and flows into an oil separator 9. Here, the refrigerating machine oil for HFC is separated completely, and only a gas refrigerant flows into cooling means 12a through a four way valve 2 and the 1st change-over valve 10.

[0104] Here, it is cooled, and a gas refrigerant is condensed and liquefied to some extent. The refrigerant of the vapor-liquid two phase condition condensed and liquefied to some extent flows into the 2nd connecting piping D through the 2nd change-over valve 11 and the 2nd actuation valve 7. Since the refrigerant which flows this is in a vapor-liquid two phase condition, the rate of flow of the residual foreign matter which remains to the 2nd connecting piping is also quick, and with liquid cooling intermediation, a residual foreign matter is washed and is washed at a rate quicker than the 1st connecting piping C at the time of air conditioning washing operation.

[0105] Then, with the residual foreign matter of the 2nd connecting piping D, the refrigerant condensed and liquefied to some extent flows into the use side side heat exchanger 6, carries out a heat exchanger to use side media, such as air, here, and is condensate-ized completely. The condensate-ized refrigerant flows into a

flow·regulator 5, it is decompressed to low voltage here, will be in a low voltage two phase condition, and will flow into the 1st connecting piping [redacted] or a vapor-liquid two phase condition, [redacted] rate of flow is also quick, and with liquid cooling intermediation, a residual foreign matter is washed and is washed at a rate quicker than the 1st connecting piping C at the time of air conditioning washing operation. With the residual foreign matter washed from the 2nd connecting piping D and the 1st connecting piping C, the refrigerant of a vapor-liquid two phase condition is heated and evaporative-gas-ized by heating means 12b through the 1st actuation valve 4, the 2nd change-over valve 11, and solenoid-valve 14of ** 2nd b, and flows into the foreign matter prehension means 13.

[0106] A phase changes with differences in the boiling point, and a residual foreign matter is classified into three kinds such as a solid-state foreign matter, a liquid foreign matter, and a gas foreign matter. With the foreign matter prehension means 13, a solid-state foreign matter and a liquid foreign matter are completely separated and caught with a gas refrigerant. As for a gas foreign matter, the part is caught, and a part is not caught. With the gas foreign matter which was not caught with the foreign matter prehension means 13, through the 1st change-over valve 10 and a four way valve 2, the blasting-fumes refrigerant flows into the heat-souce side heat exchanger 3, passes a blower etc. here, without stopping and carrying out heat exchange, and returns to a compressor 1 through an accumulator 8.

[0107] Since a gas refrigerant and the refrigerating machine oil for HFC separated completely join a main stream on the lower stream of a river of the foreign matter prehension means 13 and returns to a compressor 1 through bypass way 9a with an oil separator 9, it is not mixed with the mineral oil which remained to the 1st connecting piping C and the 2nd connecting piping D and which was, and the refrigerating machine oil for HFC is not made immiscible to HFC, and the refrigerating machine oil for HFC does not deteriorate with mineral oil.

[0108] Moreover, a solid foreign matter is not mixed with the refrigerating machine oil for HFC, either, and the refrigerating machine oil for HFC does not deteriorate. Moreover, although a part is only caught and the refrigerating machine oil for HFC and a gas foreign matter are mixed while a HFC refrigerant circulates through one cycle of refrigerant circuits and a gas foreign matter passes along the foreign matter prehension means 13 once, degradation of the refrigerating machine oil for HFC is a chemical reaction, and does not progress rapidly. The example is shown in drawing 2 . since the gas foreign matter which was not caught while passing along the foreign matter prehension means 13 once passes along the foreign matter prehension means 13 repeatedly with circulation of a HFC refrigerant -- the refrigerating machine oil for HFC -- deteriorating -- rather than -- quick -- the foreign matter prehension means 13 -- catching -- ****ing . Since the foreign matter prehension means 13 and an oil separator 9 are completely the same as that of what is shown in the gestalt 1 of operation, explanation is omitted here.

[0109] Next, air-conditioning operation is usually accompanied and explained to drawing 8 . A continuous-line arrow head shows the flow of air conditioning usual operation among drawing, and a broken-line arrow head shows the flow of heating usual operation. Air conditioning usual operation is explained first. With the refrigerating machine oil for HFC, the gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 has a compressor 1 breathed out, and flows into an oil separator 9. Here, it dissociates completely, and through a four way valve 2, it flows into the heat-souce side heat exchanger 3, and only a gas refrigerant carries out heat exchange of the refrigerating machine oil for HFC to heat-source media, such as air and water, here, and condensate-izes it.

[0110] On the other hand, as for the condensate-ized refrigerant, a part goes [the most] via the 1st change-over valve 10, cooling means 12a, and the 2nd change-over valve 11 via 3rd solenoid-valve 14c. It flows into the 1st actuation valve 4 after these joining, and it flows into a flow regulator 5 through the 1st connecting piping C, it decompresses to low voltage here, and will be in a low voltage two phase condition, and by the use side heat exchanger 6, heat exchange is carried out to use side media, such as air, and it evaporative-gas-izes. The evaporative-gas-ized refrigerant returns to a compressor 1 through the 2nd connecting piping D, the 2nd actuation valve 7, the 14d of the 4th solenoid valve, a four way valve 2, and an accumulator 8.

[0111] With an oil separator 9, through bypass way 9a, a gas refrigerant and the refrigerating machine oil for HFC separated completely join a main stream on the lower stream of a river of a four way valve 2, and returns to a compressor 1. Since the 1st solenoid-valve 14a and 2nd solenoid-valve 14b are closed, the foreign matter prehension means 13 is isolated as closing space, and the foreign matter caught during washing operation does not return all over an operation circuit again. Moreover, since it does not go via the foreign matter prehension means 13 compared with the gestalt 1 of operation, suction pressure loss of a compressor 1 is small, and the fall of capacity is small.

[0112] Next, the flow of heating usual operation is explained. With the refrigerating machine oil for HFC, the gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 has a compressor 1 breathed out, and flows into an oil separator 9. Dissociate completely and, as for the refrigerating machine oil

for HFC, most goes [a gas refrigerant] via the 14d of the 4th solenoid valve through a four way valve 2 here. On the other hand, via the 1st change-over valve 10, cooling means 12a, and the 2nd change-over valve 11, a part flows into the 2nd actuation valve 7 after these joining, flows into the use side side heat exchanger 6 through the 2nd connecting piping D, carries out a heat exchanger to use side media, such as air, here, and condensate-izes completely.

[0113] The condensate-ized refrigerant flows into a flow regulator 5, is decompressed to low voltage here, will be in a low voltage two phase condition, flows into the heat-souce side heat exchanger 3 through the 1st connecting piping C, the 1st actuation valve 4, and solenoid-valve 14of ** 3rd c, and heat exchange of it is carried out to heat-source media, such as air and water, here, and it is evaporative-gas-ized. The evaporative-gas-ized refrigerant returns to a compressor 1 through a four way valve 2 and an accumulator 8.

[0114] With an oil separator 9, a gas refrigerant and the refrigerating machine oil for HFC separated completely return to a compressor 1 through bypass way 9a. Since the 1st solenoid-valve 14a and 2nd solenoid-valve 14b are closed and the foreign matter prehension means 13 is isolated as closing space, the foreign matter caught during washing operation does not return all over an operation circuit again. Moreover, since it does not go via the foreign matter prehension means 13 compared with the gestalt 1 of operation, suction pressure loss of a compressor 1 is small, and the fall of capacity is small.

[0115] As mentioned above, the conditioner using superannuated CFC or superannuated HCFC can be changed to the conditioner using new HFC without exchanging heat souce A and an interior unit B newly and exchanging the 1st connecting piping C and the 2nd connecting piping D by building an oil separator 9 and the foreign matter prehension means 13 in heat souce A. According to such an approach, there is also no need of there being no possibility of ozone layer depletion, and there being also inflammability and no toxicity, and there being also no concern of a penetrant remover residual, and collecting penetrant removers as the established piping reuse approach since it does not carry out it being different in the conventional washing approach 1, and washing by the penetrant remover (HCFC141b and HCFC225) of dedication using a washing station.

[0116] Moreover, since it is necessary to repeat washing operation 3 times and to replace neither a HFC refrigerant nor HFC refrigerating machine oil 3 times unlike the conventional washing approach 2, since required HFC and refrigerating machine oil can be managed with one set, they are advantageous on cost and an environment. Moreover, management of the refrigerating machine oil for exchange is also unnecessary, and the danger of refrigerating-machine-oil excess and deficiency is not generated at all, either. Moreover, there is also no fear of immiscible-izing of the refrigerating machine oil for HFC or degradation of refrigerating machine oil.

[0117] By having formed the 1st solenoid-valve 14a, the 2nd solenoid-valve 14b, the 3rd solenoid-valve 14c, and the 14d of the 4th solenoid valve Acquiring the cleaning effect which passes the foreign matter prehension means 13 at the time of washing operation, and is shown above at the time of usual operation after washing operation Since the 1st solenoid-valve 14a and 2nd solenoid-valve 14b close and the foreign matter prehension means 13 is isolated as closing space, the foreign matter caught during washing operation does not return all over an operation circuit again. Moreover, since it does not go via the foreign matter prehension means 13 compared with the gestalt 1 of operation, suction pressure loss of a compressor 1 is small, and the fall of capacity is small.

[0118] Moreover, since it is not concerned with air conditioning and heating since cooling means 12a, heating means 12b, the 1st change-over valve 10, and the 2nd change-over valve 11 were formed, but liquid cooling intermediation or a vapor-liquid two phase refrigerant flows to the 1st connecting piping C and the 2nd connecting piping D at the time of washing operation, although a residual foreign matter is washed, a cleaning effect is high, and can shorten washing time amount. Moreover, since the amount of heat exchange is controllable by cooling means 12a and heating means 12b, regardless of an OAT or an indoor load, the almost same washing operation is possible at the time of the conditions of arbitration, and effectiveness and time and effort fixed-ize at it.

[0119] Although the gestalt of this operation explained the example to which one interior unit B was connected, it cannot be overemphasized that the same effectiveness is done so also with the conditioner by which two or more interior units B were connected to juxtaposition or a serial. Moreover, even if the ice thermal storage tub and the water heat storage tank (a molten bath is included) are installed in the heat-souce side heat exchanger 3, a serial, or juxtaposition, it is clear to do the same effectiveness so. Moreover, it is clear that heat souce A does the same effectiveness so also in the conditioner connected to two or more set juxtaposition. Moreover, it is the refrigerating cycle application article of not only a conditioner but a steamy compression equation, and if the unit in which the heat-souce side heat exchanger was built, and the unit in which the use side heat exchanger was built separate and are installed, it is clear to do the same effectiveness

so.

[0120] Gestalt 3. drawing 9 of opera[redacted] is drawing showing the refrigerant ci[redacted] of a conditioner as an example of the refrigerating cycle equipment by the gestalt 3 of implementation of this invention. In drawing 9 , since sign B-D, 1-8, and 8a are the same as that of what was explained with the gestalten 1 and 2 of operation, they omit detailed explanation. Moreover, since signs 10, 11, 12a, 12b, and 13 are the same as that of what was explained with the gestalt 2 of operation, they omit detailed explanation.

[0121] Next, in drawing 9 , although 9 is an oil separator and is the same as that of the gestalten 1 and 2 of operation, the points established between the 1st change-over valve 10 and cooling means 12a differ. Moreover, although 9a is the bypass way which stems from the pars basilaris ossis occipitalis of an oil separator 9, and returns to the downstream of the foreign matter prehension means 13 and is the same as that of the gestalten 1 and 2 of operation, it differs in that a return location is between the foreign matter prehension means 13 and the 1st change-over valve 10. Moreover, the 1st flow rate control means by which 15 was prepared between the 2nd change-over valve 11 and heating means 12b, and 16 are the 2nd flow rate control means established between cooling means 12a and the 2nd change-over valve 11.

[0122] The 3rd connecting piping by which CC was prepared between the 1st connecting piping C and the 1st actuation valve 4, and DD are the 2nd connecting piping D and the 4th connecting piping prepared between the 2nd actuation valve 7. The 3rd actuation valve by which 17a was prepared in the 3rd connecting piping CC, the 4th actuation valve by which 17b was prepared in the 4th connecting piping DD, The 5th actuation valve by which 17c was prepared between piping between the 1st actuation valve 4 of the 3rd connecting piping CC, and 3rd actuation valve 17a, and the 1st change-over valve 10, The 6th actuation valve prepared from 3rd actuation valve 17a of the 3rd connecting piping CC 17d between the part by the side of the 1st connecting piping C, and the 2nd change-over valve 11, 17e -- piping between the 2nd actuation valve 7 of the 4th connecting piping DD, and 4th actuation valve 17b -- ** -- the 7th actuation valve prepared between the 1st change-over valve 10 -- 17f is the 8th actuation valve prepared from 4th actuation valve 17b of the 4th connecting piping DD between the part by the side of the 2nd connecting piping D, and the 2nd change-over valve 11.

[0123] E is the soaping machine constituted as mentioned above, and builds in an oil separator 9, bypass way 9a, cooling means 12a, heating means 12b, the foreign matter prehension means 13, the 1st change-over valve 10, the 2nd change-over valve 11, the 1st flow rate control means 15, and the 2nd flow rate control means 16. this soaping machine E -- the 5- it connects possible [desorption] from the whole conditioner from the actuation valve [8th /c / 17 /-17f] part. In addition, on these specifications, as the gestalt 2 of operation indicated, let a refrigerant circuit part including heating means 12b and the foreign matter prehension means 13 be the 1st bypass way. Moreover, let the refrigerant circuit part containing cooling means 12a be the 2nd bypass way irrespective of the existence of an oil separator 9. Furthermore, let this be the 3rd bypass way supposing the case where only an oil separator 9 exists, excluding cooling means 12a.

[0124] Moreover, the 5th solenoid valve with which 18a was prepared between the 1st connecting piping C and a flow regulator 5, The 6th solenoid valve with which 18b was prepared between the 2nd connecting piping D and the use side heat exchanger 6, 18c is the 7th solenoid valve formed in the middle of piping of 18d of bypass ways which connect the 1st connecting piping C side end connection of 5th solenoid-valve 18a, and the 2nd connecting piping D side end connection of 6th solenoid-valve 18b. F is an indoor bypass machine having the 5-7th solenoid valves 18a-18c. In addition, this conditioner uses HFC as a refrigerant.

[0125] Next, the procedure of conditioner exchange when the conditioner using CFC or HCFC is superannuated is shown. CFC or HCFC(s) are collected and it exchanges for what shows heat souce A and an interior unit B to drawing 9 . The 1st connecting piping C and the 2nd connecting piping D reuse the thing of the conditioner using HCFC. The 3rd connecting piping CC and the 4th connecting piping DD are laid newly. a soaping machine E -- the 5th and 6th actuation valve 17c and 17d -- minding -- the 3rd connecting piping CC -- and it connects with the 4th connecting piping DD through the 7th and 8th actuation valve 17e and 17f. The 1st connecting piping C and the 2nd connecting piping D are connected to an interior unit B through the indoor bypass machine F.

[0126] Since heat souce A is beforehand filled up with HFC, closed, the 1st actuation valve 4 and the 2nd actuation valve 7 carry out vacuum suction for an interior unit B, the 1st connecting piping C, the 2nd connecting piping D, the 3rd connecting piping CC, the 4th connecting piping DD, a soaping machine E, and the indoor bypass machine F in the state of connection, and carry out the 1st actuation valve 4, valve opening of the 2nd actuation valve 7, and additional restoration of HFC after that.

[0127] then -- first -- the 3rd and 4th actuation valve 17a and 17b -- closing the valve -- the 4- the 8th actuation valve 17c-17f is opened, the 5th and 6 solenoid valves 18a and 18b are closed, and washing operation is carried out by opening 7th solenoid-valve 18c. then, the 3rd and 4th actuation valve 17a and 17b -

- opening -- the 4- the 8th actuation valve 17c-17f is closed, the 5th and 6 solenoid valves 18a and 18b are opened, and the air-conditioning operation usual by closing 7th solenoid-valve 18c is carried out.

[0128] Next, the contents of washing operation are accompanied and explained to drawing 9 . A continuous-line arrow head shows the flow of air conditioning washing operation among drawing, and a broken-line arrow head shows the flow of heating washing operation. Air conditioning washing operation is explained first. The gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 has a compressor 1 breathed out with the refrigerating machine oil for HFC, and through a four way valve 2, it flows into the heat-souce side heat exchanger 3, and passes, without carrying out heat exchange to heat-source media, such as air and water, here, and it flows into an oil separator 9 through the 1st actuation valve 4, actuation valve of ** 5th 17c, and the 1st change-over valve 10.

[0129] Here, it dissociates completely, and only a gas refrigerant flows into cooling means 12a, condensate-izes the refrigerating machine oil for HFC here, it is decompressed for a while by the 2nd flow rate control means 16, and will be in a vapor-liquid two phase condition. The refrigerant of this vapor-liquid two phase condition flows into the 1st connecting piping C through the 2nd change-over valve 11 and 17d of 6th actuation valve.

[0130] When the vapor-liquid two phase refrigerant of HFC flows the 1st connecting piping C, CFC-HCFC, the mineral oil, and the mineral oil degradation object (a residual foreign matter is called below) which remains to the 1st connecting piping C are washed comparatively quickly for a vapor-liquid two phase condition, and it flows with the vapor-liquid two phase refrigerant of HFC, and flows into the 2nd connecting piping D with the residual foreign matter of connecting piping C through 7th solenoid-valve 18c.

[0131] Since the refrigerant which flows this is in a vapor-liquid two phase condition, the rate of flow of the residual foreign matter which remains to the 2nd connecting piping D is also quick, and with liquid cooling intermediation, a residual foreign matter is washed and is washed at a comparatively quick rate. Then, with the residual foreign matter of the 1st connecting piping C, and the residual foreign matter of the 2nd connecting piping D, through 17f of 8th actuation valve, and the 2nd change-over valve 11, the refrigerant of a vapor-liquid two phase condition is decompressed to low voltage by the 1st flow rate control means 15, flows into heating means 12b, is evaporative-gas-ized here and flows into the foreign matter prehension means 13.

[0132] A phase changes with differences in the boiling point, and a residual foreign matter is classified into three kinds such as a solid-state foreign matter, a liquid foreign matter, and a gas foreign matter. With the foreign matter prehension means 13, a solid-state foreign matter and a liquid foreign matter are completely separated and caught with a gas refrigerant. As for a gas foreign matter, the part is caught, and a part is not caught.

[0133] The blasting-fumes refrigerant returns to a compressor 1 through the 1st change-over valve 10, actuation valve 17of ** 7th e, the 2nd actuation valve 7, a four way valve 2, and an accumulator 8 with the gas foreign matter which was not caught with the foreign matter prehension means 13. With an oil separator 9, a gas refrigerant and the refrigerating machine oil for HFC separated completely Since a main stream is joined by the downstream of the foreign matter prehension means 13 and it returns to a compressor 1 through bypass way 9a It is not mixed with the mineral oil which remained to the 1st connecting piping C and the 2nd connecting piping D and which was, and the refrigerating machine oil for HFC is not made immiscible to HFC, and the refrigerating machine oil for HFC does not deteriorate with mineral oil.

[0134] Moreover, a solid foreign matter is not mixed with the refrigerating machine oil for HFC, either, and the refrigerating machine oil for HFC does not deteriorate. Moreover, although a part is only caught and the refrigerating machine oil for HFC and a gas foreign matter are mixed while a HFC refrigerant circulates through one cycle of refrigerant circuits and a gas foreign matter passes along the foreign matter prehension means 13 once, degradation of the refrigerating machine oil for HFC is a chemical reaction, and does not progress rapidly. The example is shown in drawing 2 . since the gas foreign matter which was not caught while passing along the foreign matter prehension means 13 once passes along the foreign matter prehension means 13 repeatedly with circulation of a HFC refrigerant -- the refrigerating machine oil for HFC -- deteriorating -- rather than -- quick -- the foreign matter prehension means 13 -- catching -- ****ing .

[0135] Next, the flow of heating washing operation is explained. With the refrigerating machine oil for HFC, the gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 has a compressor 1 breathed out, and flows into an oil separator 9 through a four way valve 2, the 2nd actuation valve 7, actuation valve of ** 7th 17e, and the 1st change-over valve 10. Here, the refrigerating machine oil for HFC is separated completely, and only a gas refrigerant flows into cooling means 12a. Here, it is cooled, and a gas refrigerant is condensed and liquefied.

[0136] The liquid cooling intermediation condensed and liquefied is decompressed for a while by the 2nd flow rate control means 16, will be in a vapor-liquid two phase condition, and will flow into the 2nd connecting piping

D through the 2nd change-over valve 11 and 17f of 8th actuation valve. Since the refrigerant which flows this is in a vapor-liquid two phase condit[illegible]the rate of flow of the residual foreig[illegible]tter which remains to the 2nd connecting piping is also quick, and with liquid cooling intermediation, a residual foreign matter is washed and is washed at a comparatively quick rate.

[0137] Then, the vapor-liquid two phase refrigerant flows into the 1st connecting piping C through 7th solenoid-valve 18c with the residual foreign matter of the 2nd connecting piping D. Here, for a vapor-liquid two phase condition, the rate of flow is also quick, and with liquid cooling intermediation, a residual foreign matter is washed and is washed at a comparatively quick rate.

[0138] With the residual foreign matter washed from the 2nd connecting piping D and the 1st connecting piping C, through 17d of 6th actuation valve, and the 2nd change-over valve 11, the refrigerant of a vapor-liquid two phase condition is decompressed to low voltage by the 1st flow rate control means 15, flows into heating means 12b, is evaporative-gas-ized here and flows into the foreign matter prehension means 13. A phase changes with differences in the boiling point, and a residual foreign matter is classified into three kinds such as a solid-state foreign matter, a liquid foreign matter, and a gas foreign matter.

[0139] With the foreign matter prehension means 13, a solid-state foreign matter and a liquid foreign matter are completely separated and caught with a gas refrigerant. As for a gas foreign matter, the part is caught, and a part is not caught. With the gas foreign matter which was not caught with the foreign matter prehension means 13, through the 1st change-over valve 10 and actuation valve 17of ** 5th c, the blasting-fumes refrigerant flows into the heat-souce side heat exchanger 3, passes a blower etc. here, without stopping and carrying out heat exchange, and returns to a compressor 1 through an accumulator 8.

[0140] Since a gas refrigerant and the refrigerating machine oil for HFC separated completely join a main stream by the downstream of the foreign matter prehension means 13 and returns to a compressor 1 through bypass way 9a with an oil separator 9, it is not mixed with the mineral oil which remained to the 1st connecting piping C and the 2nd connecting piping D, and the refrigerating machine oil for HFC is not made immiscible to HFC, and the refrigerating machine oil for HFC does not deteriorate with mineral oil.

[0141] Moreover, a solid foreign matter is not mixed with the refrigerating machine oil for HFC, either, and the refrigerating machine oil for HFC does not deteriorate. Moreover, although a part is only caught and the refrigerating machine oil for HFC and a gas foreign matter are mixed while a HFC refrigerant circulates through one cycle of refrigerant circuits and a gas foreign matter passes along the foreign matter prehension means 13 once, degradation of the refrigerating machine oil for HFC is a chemical reaction, and does not progress rapidly. The example is shown in drawing 2 . since the gas foreign matter which was not caught while passing along the foreign matter prehension means 13 once passes along the foreign matter prehension means 13 repeatedly with circulation of a HFC refrigerant -- the refrigerating machine oil for HFC -- deteriorating -- rather than -- quick -- the foreign matter prehension means 13 -- catching -- ****ing . Since the foreign matter prehension means 13 and an oil separator 9 are completely the same as that of what is shown in the gestalt 1 of operation, explanation is omitted here.

[0142] Next, air-conditioning operation is usually accompanied and explained to drawing 10 . A continuous-line arrow head shows the flow of air conditioning usual operation among drawing, and a broken-line arrow head shows the flow of heating usual operation. Air conditioning usual operation is explained first. The gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 has a compressor 1 breathed out, and through a four way valve 2, it flows into the heat-souce side heat exchanger 3, and the heat exchanger of it is carried out to heat-source media, such as air and water, here, and it is condensate-ized. Through the 1st actuation valve 4, actuation valve of ** 3rd 17a, the 1st connecting piping C, and 5th solenoid-valve 18a, the condensate-ized refrigerant flows into a flow regulator 5, is decompressed to low voltage here, will be in a low voltage two phase condition, and by the use side heat exchanger 6, heat exchange of it is carried out to use side media, such as air, and it is evaporative-gas-ized.

[0143] The evaporative-gas-ized refrigerant returns to a compressor 1 through the 6th solenoid-valve 18b, the 2nd connecting piping D, actuation valve 17of ** 4th b, the 2nd actuation valve 7, a four way valve 2, and an accumulator 8. Since the 5-8th actuation valves 17c-17f are closed and the foreign matter prehension means 13 is isolated as closing space, the foreign matter caught during washing operation does not return all over an operation circuit again. Moreover, since it does not go via the foreign matter prehension means 13 compared with the gestalt 1 of operation, suction pressure loss of a compressor 1 is small, and the fall of capacity is small.

[0144] Next, the flow of heating usual operation is explained. The gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 has a compressor 1 breathed out, and through a four way valve 2, it flows into the 2nd actuation valve 7, and flows into the use side side heat exchanger 6 through 4th actuation valve 17b, the 2nd connecting piping D, and 6th solenoid-valve 18b, and the heat exchanger of it is carried out

to use side media, such as air, here, and it is condensate-ized.
[0145] The condensate-ized refrige[redacted] flows into a flow regulator 5, it is dec[redacted]ressed to low voltage here, will be in a low voltage two phase condition, flows into the 5th solenoid-valve 18a, the 1st connecting piping C, actuation valve 17of ** 3rd a, the 1st actuation valve 4, and the heat-souce side heat exchanger 3, and heat exchange of it is carried out to heat-source media, such as air and water, here, and it is evaporative-gas-ized. The evaporative-gas-ized refrigerant returns to a compressor 1 through a four way valve 2 and an accumulator 8.
[0146] Since the 5-8th actuation valves 17c-17f are closed and the foreign matter prehension means 13 is isolated as closing space, the foreign matter caught during washing operation does not return all over an operation circuit again. Moreover, since it does not go via the foreign matter prehension means 13 compared with the gestalt 1 of operation, suction pressure loss of a compressor 1 is small, and the fall of capacity is small. Moreover, since a refrigerant does not flow to cooling means 12a unlike the gestalt 2 of operation, there is also no loss of heating capacity.
[0147] As mentioned above, the conditioner using superannuated CFC or superannuated HCFC can be changed to the conditioner using new HFC without exchanging heat souce A and an interior unit B newly and exchanging the 1st connecting piping C and the 2nd connecting piping D by building an oil separator 9 and the foreign matter prehension means 13 in a soaping machine E. Since it does not carry out it being different in the conventional washing approach 1 as the established piping reuse approach, and washing by the penetrant remover (HCFC141b and HCFC225) of dedication using a washing station by such approach, there is no possibility of ozone layer depletion, and there are also inflammability and no toxicity, there is also no concern of a penetrant remover residual, and there is also no need of collecting penetrant removers.
[0148] Moreover, since it is necessary to repeat washing operation 3 times and to replace neither a HFC refrigerant nor HFC refrigerating machine oil 3 times unlike the conventional washing approach 2, since required HFC and refrigerating machine oil can be managed with one set, they are advantageous on cost and an environment. Moreover, management of the refrigerating machine oil for exchange is also unnecessary, and the danger of refrigerating-machine-oil excess and deficiency is not generated at all, either. Moreover, there is also no fear of immiscible-izing of the refrigerating machine oil for HFC or degradation of refrigerating machine oil.
[0149] Acquiring the cleaning effect which passes the foreign matter prehension means 13 at the time of washing operation, and is shown above by having formed the 5-8th actuation valves 17c-17f moreover, at the time of usual operation after washing operation Since the 5-8th actuation valves 17c-17f are closed and the foreign matter prehension means 13 is isolated as closing space, the foreign matter caught during washing operation does not return all over an operation circuit again. Moreover, since it does not go via the foreign matter prehension means 13 compared with the gestalt 1 of operation, suction pressure loss of a compressor 1 is small, and the fall of capacity is small.
[0150] Moreover, since it is not concerned with air conditioning and heating since cooling ******12a, heating means 12b, the 1st change-over valve 10, and the 2nd change-over valve 11 were formed, but liquid cooling intermediation or a vapor-liquid two phase refrigerant flows to the 1st connecting piping C and the 2nd connecting piping D at the time of washing operation, although a residual foreign matter is washed, a cleaning effect is high, and can shorten washing time amount. Moreover, since the amount of heat exchange is controllable by cooling means 12a and heating means 12b, regardless of an OAT or an indoor load, the almost same washing operation is possible at the time of the conditions of arbitration, and effectiveness and time and effort fixed-ize at it.
[0151] Moreover, since the refrigerant which flows the 1st and 2nd connecting piping C and D since the 1st flow rate control means 15 and the 2nd flow rate control means 16 were established can surely be made into a vapor-liquid two phase condition, although a residual foreign matter is washed further, a cleaning effect is high, and can shorten washing time amount. Moreover, since the pressure and dryness fraction of the flowing vapor-liquid two phase refrigerant can also control the 1st and 2nd connecting piping C and D, further, the almost same washing operation is possible at the time of the conditions of arbitration, and effectiveness and time and effort fixed-ize at it.
[0152] Moreover, since the condition of the refrigerant which flows the 1st and 2nd connecting piping C and D since the indoor bypass machine F was formed can be made almost the same, uniform washing operation is possible and effectiveness and time and effort fixed-ize. Moreover, since a residual foreign matter does not flow into the new interior unit B, contamination of an interior unit B can be prevented.
[0153] Moreover, since an oil separator 9, bypass way 9a, cooling means 12a, heating means 12b, the foreign matter prehension means 13, the 1st change-over valve 10, the 2nd change-over valve 11 of the above, the 1st flow rate control means 15, and the 2nd flow rate control means 16 were built in the soaping machine E,-

izing of the heat souce A can be carried out [a miniaturization and low cost]. Moreover, heat souce A can be made into common heat souce also [redacted] laying newly the 1st and 2nd conne[redacted] piping C and D.
[0154] moreover, the soaping machine E -- the 5- since it connects possible [desorption] from the whole conditioner in the part which is the 8th actuation valve 17c-17f, after closing these actuation valve after washing operation, the refrigerants inside a soaping machine E can be collected, and it can remove from a conditioner, it can attach in same another conditioner, and washing operation can be carried out.
[0155] Although the gestalt of this operation explained the example to which one interior unit B was connected, it cannot be overemphasized that the same effectiveness is done so also with the conditioner by which two or more interior units B were connected to juxtaposition or a serial. Moreover, even if the ice thermal storage tub and the water heat storage tank (a molten bath is included) are installed in the heat-souce side heat exchanger 3, a serial, or juxtaposition, it is clear to do the same effectiveness so.
[0156] Moreover, it is clear that heat souce A does the same effectiveness so also in the conditioner connected to two or more set juxtaposition. Moreover, it is the refrigerating cycle application article of not only a conditioner but a steamy compression equation, and if the unit in which the heat-souce side heat exchanger was built, and the unit in which the use side heat exchanger was built separate and are installed, it is clear to do the same effectiveness so. Moreover, it is clear to present the same effectiveness with the gestalt of this operation, even if more than one are installed although only one soaping machine E is installed in one conditioner.
[0157] gestalt 4. of operation -- in the gestalt 4 of implementation of this invention, in drawing 9 of the gestalt 3 of operation, the inlet which pours in mineral oil between the oil separator 9 of a soaping machine E and the 2nd change-over valve 11 is prepared, or the tank of mineral oil is formed. This mineral oil is supplied to the 1st and 2nd connecting piping C and D, and the residual foreign matter which refrigerating machine oil sludged is washed, and is made to catch like the gestalt 3 of operation with the foreign matter prehension means 13 by making it dissolve in this mineral oil at the time of washing operation.
[0158] gestalt 5. of operation -- in the gestalt 5 of implementation of this invention, in drawing 9 of the gestalt 3 of operation, the inlet which pours in water between the oil separator 9 of a soaping machine E and the 2nd change-over valve 11 is prepared, or the tank of water is formed. This water is supplied to the 1st and 2nd connecting piping C and D, and it washes and is made to catch like the gestalt 3 of operation with the foreign matter prehension means 13 by making ferric chloride ionize at the time of washing operation. Although a supersaturated part becomes a low voltage refrigerant with liquid moisture among the moisture at this time, since the consistency is larger than mineral oil, this moisture piles up in the pars basilaris ossis occipitalis of the foreign matter prehension means 13. By forming a dryer (water adsorption means) in either heat souce A or the 1st, 2nd, 3rd, and 4th connecting piping C, D, CC, and DD, the moisture saturating to a low voltage refrigerant can be made to be able to stick to a dryer, and can reduce the moisture in a refrigerant circuit.
[0159] In addition, also in the gestalt 2 of operation, as the gestalt 3 of operation explained, it can equip with the indoor bypass machine F. Moreover, also in the gestalt 5 of operation, it can be similar to the gestalt 3 of operation, and a refrigerant circuit part (1st bypass way) including heating means 12b and the foreign matter prehension means 13 and the refrigerant circuit part (2nd bypass way) containing cooling means 12a can be closed or separated from a refrigerant circuit main. in addition, although it is alike in detail and not being illustrated, this invention is such a thing that combines or also includes deformation.
[0160]
[Effect of the Invention] Since this invention is constituted as mentioned above, the following effectiveness is done so. Since it had a foreign matter prehension means to catch the foreign matter in a refrigerant to the refrigerant circuit from a use side heat exchanger to a compressor, in the air conditioning circuit according to invention according to claim 1, it can fully dissociate and the solid-state foreign matter and liquid foreign matter in the refrigerant washed from established connecting piping can be caught. A gas foreign matter can be caught while a refrigerant passes along a foreign matter prehension means several times. Since it had a foreign matter prehension means to catch the foreign matter in a refrigerant to the refrigerant circuit from a use side heat exchanger to an accumulator, in the air conditioning circuit according to invention according to claim 2, it can fully dissociate and the solid-state foreign matter and liquid foreign matter in the refrigerant washed from established connecting piping can be caught. A gas foreign matter can be caught while a refrigerant passes along a foreign matter prehension means several times.
[0161] Moreover, since it had a foreign matter prehension means to have prepared the 1st bypass way which bypasses the refrigerant circuit from a use side heat exchanger to an accumulator in an air conditioning circuit, and to catch the foreign matter in a refrigerant according to invention according to claim 3, it can fully dissociate and the solid-state foreign matter and liquid foreign matter in the refrigerant washed from established connecting piping can be caught. A gas foreign matter can be caught while a refrigerant passes

along a foreign matter prehension means several times.
[0162] Moreover, according to inven[illegible]according to claim 4, in invention acc[illegible]g to claim 3, the 2nd bypass way which bypasses the refrigerant circuit from a heat-souce side heat exchanger to a flow regulator was prepared, it had the cooling means of a refrigerant, and the upstream of the foreign matter prehension means of the 1st bypass way was further equipped with the heating means of a refrigerant. Since it can fully dissociate, and the foreign matter in the refrigerant washed from established connecting piping can be caught by this, and also the heating means and cooling means of a refrigerant were established further and liquid cooling intermediation or a vapor-liquid two phase refrigerant flows to the connecting piping to an interior unit at the time of washing operation, although a residual foreign matter is washed, a cleaning effect is high, and can shorten washing time amount. Moreover, since the amount of heat exchange is controllable by the heating means and the cooling means, regardless of an OAT or an indoor load, the almost same washing operation is possible at the time of the conditions of arbitration, and effectiveness and time and effort fixed-ize at it.
[0163] Moreover, according to invention according to claim 5, in invention according to claim 4, the upstream of the heating means of the 1st bypass way was equipped with the 1st flow rate control means, and the downstream of the cooling means of the 2nd bypass way was further equipped with the 2nd flow rate control means. That is, the flow rate control means which controls the flow rate of the refrigerant which flows into the connecting piping from heat souce to an interior unit, or flows out of the connecting piping to an interior unit was established. Since the refrigerant which flows the connecting piping to an interior unit can surely be made into a vapor-liquid two phase condition by this, although a residual foreign matter is washed further, a cleaning effect is high, and washing time amount can be shortened. Moreover, since the pressure and dryness fraction of the flowing vapor-liquid two phase refrigerant can also control connecting piping, further, the almost same washing operation is possible at the time of the conditions of arbitration, and effectiveness and time and effort fixed-ize at it.
[0164]
[0165]
[0166] Moreover, according to invention according to claim 6, in invention according to claim 1 to 5, it had an oil-separation means to separate the oil component of a refrigerant into the refrigerant circuit to a heat-souce side heat exchanger from a compressor. A foreign matter prehension means is formed in a refrigerant circuit, by this, while fully dissociating and catching a foreign matter from a refrigerant, an oil separator can be formed and the refrigerating machine oil for new refrigerants can fully be separated from a refrigerant, and it can prevent that new refrigerating machine oil flows into an interior unit side. Therefore, the foreign matter in the washed refrigerant and new refrigerating machine oil (for example, refrigerating machine oil for HFC) are not mixed, and new refrigerating machine oil does not deteriorate.
[0167] Moreover, according to invention according to claim 7, in invention of claim 3, the 3rd bypass way which bypasses the refrigerant circuit from a heat-souce side heat exchanger to a flow regulator was prepared, and it had an oil-separation means to separate the oil component of a refrigerant. A foreign matter prehension means is formed in the refrigerant circuit of a soaping machine, by this, while fully dissociating and catching a foreign matter from a refrigerant, an oil separator is formed and the refrigerating machine oil for new refrigerants is fully separated from a refrigerant, and it can prevent that new refrigerating machine oil flows into an interior unit side. Therefore, the foreign matter in the washed refrigerant and new refrigerating machine oil (for example, refrigerating machine oil for HFC) are not mixed, and new refrigerating machine oil does not deteriorate.
[0168] Moreover, according to invention according to claim 8, in invention of claim 4, it had an oil-separation means to divide the oil component of a refrigerant into the upstream of the cooling means of the 2nd bypass way. By this, with the heating means and cooling means of a refrigerant, while obtaining further the cleaning effect of the foreign matter in connecting piping, the prehension effectiveness of a foreign matter is raised, and it can prevent that new refrigerating machine oil flows into an interior unit side with an oil separator. Moreover, the foreign matter in the washed refrigerant and new refrigerating machine oil (for example, refrigerating machine oil for HFC) are not mixed, and new refrigerating machine oil does not deteriorate.
[0169] According to invention according to claim 9, it had a foreign matter prehension means to have been a refrigerant circuit from the use side heat exchanger in an air conditioning circuit to a compressor, and to catch the foreign matter in a refrigerant to the refrigerant circuit from the heat-souce side heat exchanger in a heating circuit to a compressor. Thereby, it can fully dissociate and the solid-state foreign matter and liquid foreign matter in the refrigerant washed from established connecting piping can be caught. A gas foreign matter can be caught while a refrigerant passes along a foreign matter prehension means several times.
According to invention according to claim 10, it had a foreign matter prehension means to have been a refrigerant circuit from the use side heat exchanger in an air conditioning circuit to an accumulator, and to

catch the foreign matter in a refrigerant to the refrigerant circuit from the heat-souce side heat exchanger in a heating circuit to an accumulator. Thereby, it can fully dissociate and the solid-state foreign matter and liquid foreign matter in the refrigerant washed from established connecting piping can be caught. A gas foreign matter can be caught while a refrigerant passes along a foreign matter prehension means several times.

[0170] According to invention according to claim 11, the 1st bypass way which bypasses the refrigerant circuit from the use side heat exchanger in an air conditioning circuit to an accumulator, and bypasses the refrigerant circuit from the rate controller in a heating circuit to a heat-souce side heat exchanger was prepared, and it had a foreign matter prehension means to catch the foreign matter in a refrigerant. Thereby, it can fully dissociate and the solid-state foreign matter and liquid foreign matter in the refrigerant washed from established connecting piping can be caught. A gas foreign matter can be caught while a refrigerant passes along a foreign matter prehension means several times.

[0171] According to invention according to claim 12, in invention according to claim 11, the 2nd bypass way which bypasses the refrigerant circuit from a heat-souce side heat exchanger to a rate controller in an air conditioning circuit, and bypasses the refrigerant circuit from a compressor to a use side heat exchanger in a heating circuit was prepared, it had the cooling means of a refrigerant, and the upstream of the foreign matter prehension means of the 1st bypass way was further equipped with the heating means of a refrigerant. Since it is not concerned with air conditioning and heating since it can fully dissociate, and the foreign matter in the refrigerant washed from established connecting piping can be caught by this and also the heating means and cooling means of a refrigerant were established further, but liquid cooling intermediation or a vapor-liquid two phase refrigerant flows to the connecting piping to an interior unit at the time of washing operation, although a residual foreign matter is washed, a cleaning effect is high, and can shorten washing time amount. Moreover, since the amount of heat exchange is controllable by the heating means and the cooling means, regardless of an OAT or an indoor load, the almost same washing operation is possible at the time of the conditions of arbitration, and effectiveness and time and effort fixed-ize at it.

[0172] According to invention according to claim 13, in invention of claim 12, the upstream of the heating means of the 1st bypass way was equipped with the 1st flow rate control means, and the downstream of the cooling means of the 2nd bypass way was further equipped with the 2nd flow rate control means. That is, the flow rate control means which controls the flow rate of the refrigerant which flows into the connecting piping from heat souce to an interior unit, or flows out of the connecting piping to an interior unit was established. Since the refrigerant which flows the connecting piping to an interior unit can surely be made into a vapor-liquid two phase condition by this, although a residual foreign matter is washed further, a cleaning effect is high, and washing time amount can be shortened. Moreover, since the pressure and dryness fraction of the flowing vapor-liquid two phase refrigerant can also control connecting piping, further, the almost same washing operation is possible at the time of the conditions of arbitration, and effectiveness and time and effort fixed-ize at it.

[0173]

[0174]

[0175] According to invention according to claim 14, in invention of claims 9-13, it had an oil-separation means to have been a refrigerant circuit from the compressor in an air conditioning circuit to a heat-souce side heat exchanger, and to divide the oil component of a refrigerant into the refrigerant circuit from the compressor in a heating circuit to a use side heat exchanger. A foreign matter prehension means is formed in a refrigerant circuit, by this, while fully dissociating and catching a foreign matter from a refrigerant, an oil separator can be formed and the refrigerating machine oil for new refrigerants can fully be separated from a refrigerant, and it can prevent that new refrigerating machine oil flows into an interior unit side. Therefore, the foreign matter in the washed refrigerant and new refrigerating machine oil (for example, refrigerating machine oil for HFC) are not mixed, and new refrigerating machine oil does not deteriorate.

[0176] According to invention according to claim 15, in invention of claim 12, it had an oil-separation means to have been a refrigerant circuit from the compressor in an air conditioning circuit to a heat-souce side heat exchanger, and to divide the oil component of a refrigerant into the refrigerant circuit from the compressor in a heating circuit to a cooling means. By this, with the heating means and cooling means of a refrigerant, while obtaining further the cleaning effect of the foreign matter in connecting piping, the prehension effectiveness of a foreign matter is raised, and it can prevent that new refrigerating machine oil flows into an interior unit side with an oil separator. Moreover, the foreign matter in the washed refrigerant and new refrigerating machine oil (for example, refrigerating machine oil for HFC) are not mixed, and new refrigerating machine oil does not deteriorate.

[0177] According to invention according to claim 16, in invention of claim 11, the 3rd bypass way which bypasses the refrigerant circuit from a heat-souce side heat exchanger to a rate controller in an air

conditioning circuit, and bypasses the refrigerant circuit from a compressor to a use side heat exchanger in a heating circuit was prepared, and it [redacted] an oil-separation means to separate [redacted]oil component of a refrigerant. A foreign matter prehension means is formed in the refrigerant circuit of a soaping machine, by this, while fully dissociating and catching a foreign matter from a refrigerant, an oil separator can be formed and the refrigerating machine oil for new refrigerants can fully be separated from a refrigerant, and it can prevent that new refrigerating machine oil flows into an interior unit side. Therefore, the foreign matter in the washed refrigerant and new refrigerating machine oil (for example, refrigerating machine oil for HFC) are not mixed, and new refrigerating machine oil does not deteriorate.

[0178] According to invention according to claim 17, in invention of claim 12, it had an oil-separation means to divide the oil component of a refrigerant into the upstream of the cooling means of the 2nd bypass way. By this, with the heating means and cooling means of a refrigerant, while obtaining further the cleaning effect of the foreign matter in connecting piping, the prehension effectiveness of a foreign matter is raised, and it can prevent that new refrigerating machine oil flows into an interior unit side with an oil separator. Moreover, the foreign matter in the washed refrigerant and new refrigerating machine oil (for example, refrigerating machine oil for HFC) are not mixed, and new refrigerating machine oil does not deteriorate.

[0179] Since the condition of the refrigerant which flows the connecting piping connected to the both sides of an interior unit since the indoor bypass machine with which a refrigerant bypasses an interior unit was formed according to invention according to claim 18 can be made almost the same, uniform washing operation is possible and effectiveness and time and effort fixed-ize. Moreover, since it does not flow into the new interior unit with which the residual foreign matter was permuted, contamination of a new interior unit can be prevented.

[0180] According to invention according to claim 19, it had the reflux way which returns the oil component separated by the oil-separation means to an accumulator by the downstream from a foreign matter prehension means. Since the refrigerant after this separated the refrigerating machine oil in the refrigerant breathed out from the compressor (for example, refrigerating machine oil for HFC) from the refrigerant and the foreign matter was caught is returned to a compressor, refrigerating machine oil is not mixed with the mineral oil which remained to connecting piping, and the refrigerating machine oil for HFC is not made immiscible to HFC. Moreover, the refrigerating machine oil for HFC does not deteriorate with mineral oil.

[0181] According to invention according to claim 20, the refrigerant was equipped with a mineral oil impregnation means to pour in mineral oil at the downstream of the oil-separation means of the 2nd bypass way. Since mineral oil can be poured into the refrigerant which flows into the connecting piping connected to the interior unit by this, the residual foreign matter in the connecting piping which refrigerating machine oil sludged can be washed by making it dissolve in this mineral oil, and can be caught with a foreign matter prehension means.

[0182] According to invention according to claim 21, the refrigerant was equipped with a water impregnation means to pour in water at the downstream of the oil-separation means of the 2nd bypass way. Since water can be poured into the refrigerant which flows into the connecting piping connected to the interior unit by this, it can wash by making the ferric chloride in connecting piping ionize, and can catch with a foreign matter prehension means.

[0183] According to invention according to claim 22, the refrigerant circuit was equipped with a water adsorption means to adsorb the moisture in a refrigerant. The moisture which poured in for washing of ferric chloride and became supersaturation by this can be adsorbed, and can be reduced.

[0184] Since the rate of flow of a refrigerant is reduced and it was made to separate the foreign matter in a refrigerant with a foreign matter prehension means according to invention according to claim 23, the foreign matter in a refrigerant is separable.

[0185] According to invention according to claim 24, in a foreign matter prehension means, the foreign matter in a refrigerant can be caught by letting a refrigerant pass in mineral oil.

[0186] According to invention according to claim 25, in a foreign matter prehension means, CFC and HCFC in a refrigerant can be dissolved and caught by letting a refrigerant pass in mineral oil.

[0187] According to invention according to claim 26, in a foreign matter prehension means, the foreign matter in a refrigerant can be caught by letting a refrigerant pass in a filter.

[0188] According to invention according to claim 27, in a foreign matter prehension means, the chlorine ion in a refrigerant can be caught by letting a refrigerant pass on ion exchange resin.

[0189] According to invention according to claim 28, the 1st bypass way, the 2nd bypass way, and the 3rd bypass way were prepared free [separation] from the refrigerant circuit. The part of a bypass way including a foreign matter prehension means is separable with the main of refrigerant piping by this, and after washing operation can close a bypass way and can usually operate. Therefore, the foreign matter caught during washing

operation does not return all over an operation circuit again. Moreover, since it does not go via a foreign matter prehension means, suction pressure loss of a compressor is small and fall of capacity is small. Moreover, when a soaping machine is constituted including an oil separator and a foreign matter prehension means on a bypass way, the part of a soaping machine is separable with the main of refrigerant piping, and after washing operation can close a soaping machine and can usually operate. Furthermore, since a soaping machine is separated from the whole refrigerating cycle equipment and it can connect possible [desorption], it can remove soaping-machine picking after washing operation.

[0190] According to invention of claims 29-31, the 1st connecting piping and 2nd connecting piping which were being used with the CFC refrigerant or the HCFC refrigerant are reused. Since it had a foreign matter prehension means to catch the mineral oil which remains to the 1st connecting piping and 2nd connecting piping, a solid foreign matter and a liquid foreign matter, a residual foreign matter, etc. out of the HFC refrigerant which has flowed It can fully dissociate and the mineral oil or solid-state foreign matter, and liquid foreign matter in the refrigerant washed from established connecting piping can be caught. A gas foreign matter can be caught while a refrigerant passes along a foreign matter prehension means several times.

[0191] According to invention according to claim 32, in the existing refrigerating cycle equipment using (the 1st refrigerant), a device can be permuted by the thing using (the 2nd refrigerant), and the refrigerating cycle equipment of each above-mentioned invention can be formed using the existing refrigerant piping. Thereby, the foreign matter in established refrigerant piping is caught, as new refrigerating machine oil does not flow into established connecting piping, only heat souce and an interior unit are exchanged newly, and the refrigerating cycle equipment using the superannuated old refrigerant (for example, CFC or HCFC) can be changed to the refrigerating cycle equipment using a new refrigerant (for example, HFC) without exchanging the connecting piping which connects heat souce and an interior unit. Moreover, since it does not carry out washing connecting piping by the penetrant remover of dedication, there is no possibility of ozone layer depletion, and there are also inflammability and no toxicity, there is also no concern of a penetrant remover residual, and there is also no need of collecting penetrant removers. Moreover, since required HFC and refrigerating machine oil end by necessary minimum, they are advantageous on cost and an environment. Moreover, management of the refrigerating machine oil for exchange is also unnecessary, and the danger of refrigerating-machine-oil excess and deficiency is not generated at all, either. Moreover, there is also no fear of immiscible-izing of the refrigerating machine oil for HFC or degradation of refrigerating machine oil.

[0192] Moreover, since it had a foreign matter prehension means to catch the residual foreign matter which remained to the established connecting piping which was being used for refrigerant piping built in the exterior unit with the CFC refrigerant or the HCFC refrigerant out of the HFC refrigerant which has flowed according to invention according to claim 33 or 34, it can fully dissociate and the solid-state foreign matter and liquid foreign matter in the HFC refrigerant washed from established connecting piping can be caught. Moreover, a gas foreign matter can be caught while a HFC refrigerant passes along a foreign matter prehension means several times.

[0193]

[Translation done.]

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] Drawing showing the refrigerant circuit of a conditioner as an example of the refrigerating cycle equipment by the gestalt 1 of implementation of this invention.

[Drawing 2] It is drawing showing time amount change of degradation when chlorine is mixing (175 degrees C)

in the refrigerating machine oil for HFC.
[Drawing 3] Drawing 3 illustrates an example of the foreign matter prehension means 13.
[Drawing 4] Drawing showing the solubility of mineral oil and CFC, and the solubility of mineral oil and HCFC.
[Drawing 5] Drawing showing the structure of an oil separator.
[Drawing 6] Drawing showing the rate of flow of a gas refrigerant and the relation of separation efficiency to an oil separator.
[Drawing 7] Drawing showing the refrigerant circuit of a conditioner as an example of the refrigerating cycle equipment by the gestalt 2 of implementation of this invention.
[Drawing 8] Drawing showing the condition of usual air-conditioning operation of the refrigerating cycle equipment by the gestalt 2 of implementation of this invention.
[Drawing 9] Drawing showing the refrigerant circuit of a conditioner as an example of the refrigerating cycle equipment by the gestalt 3 of implementation of this invention.
[Drawing 10] Drawing showing the condition of usual air-conditioning operation of the refrigerating cycle equipment by the gestalt 3 of implementation of this invention.
[Drawing 11] Drawing showing the refrigerant circuit of the conditioner of the conventional separate form.
[Drawing 12] Drawing showing the critical solubility which shows the solubility of the refrigerating machine oil for HFC at the time of mineral oil mixing, and a HFC refrigerant.
[Drawing 13] Drawing explaining the washing approach of the conventional conditioner.
[Description of Notations]
A Heat souce B Interior unit C The 1st connecting piping D The 2nd connecting piping, E Soaping machine CC The 3rd connecting piping DD The 4th connecting piping, 1 Compressor 1 2 Four way valve 2 3 Heat-souce side heat exchanger, 4 1st actuation valve Five flow regulators 6 Use side heat exchanger, 7 2nd actuation valve 8 Accumulator 9 Oil separator, 10 The 1st change-over valve 11 The 2nd change-over valve 12a Cooling means, 12b Heating means 13 Foreign matter prehension means The 14a-14d 1st-4th solenoid valve, 15 1st flow rate control means 16 The 2nd flow rate control means, 17a-17f the 3- 8th actuation valve The 18a - 18c 5th-7th solenoid valve 51 Container 52 Outflow piping 53 filters 54 Mineral oil 55 Inflow piping 56 Ion exchange resin.

[Translation done.]

* NOTICES *

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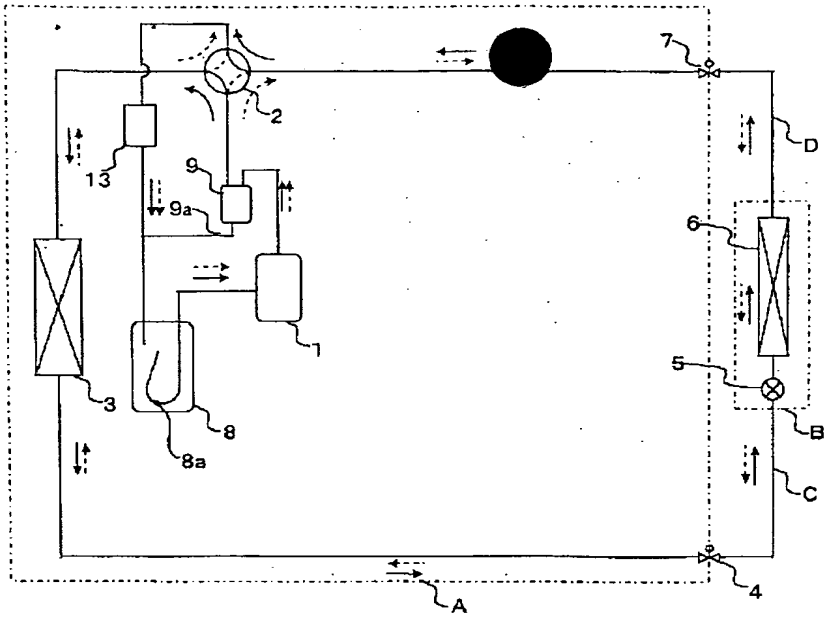
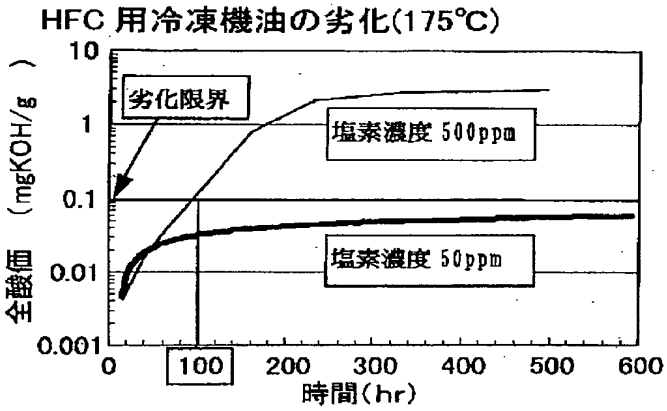
DRAWINGS

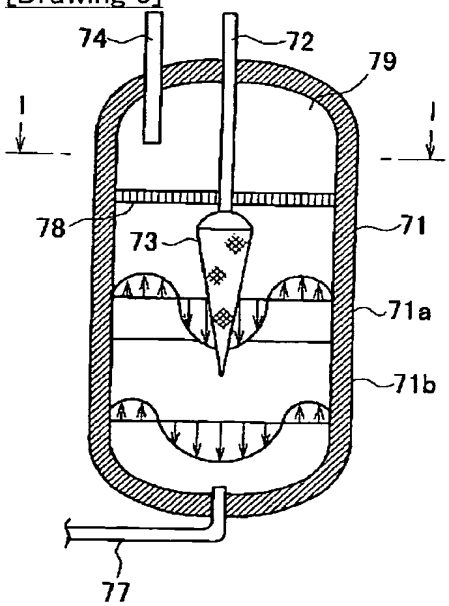
[Drawing 1]



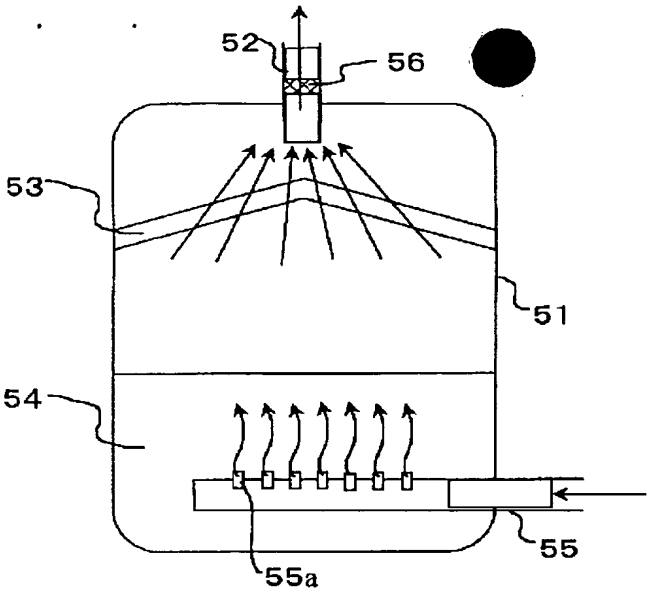
[Drawing 2]



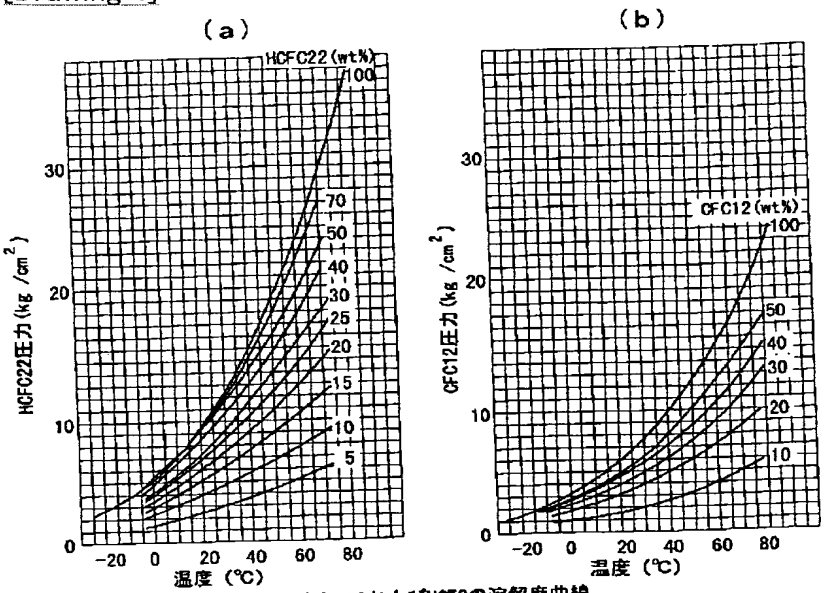
[Drawing 5]



[Drawing 3]

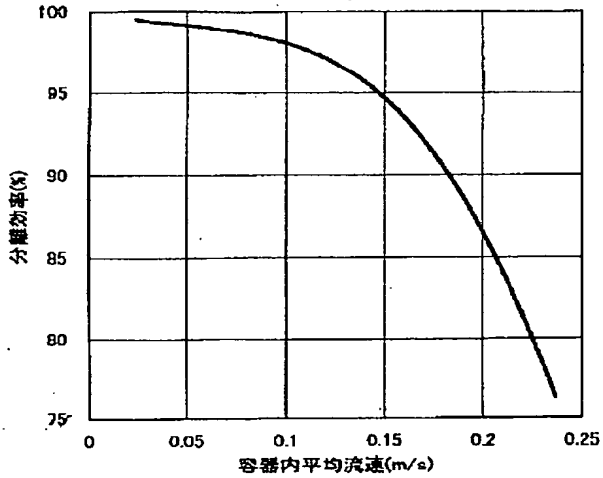


[Drawing 4]



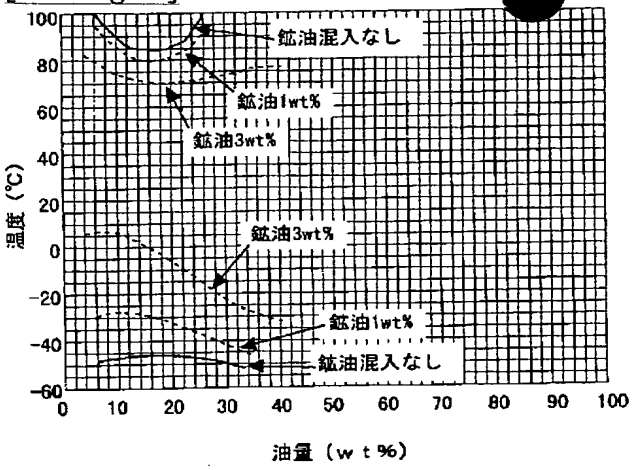
鉱油とCFCおよびHCFCの溶解度曲線

[Drawing 6]



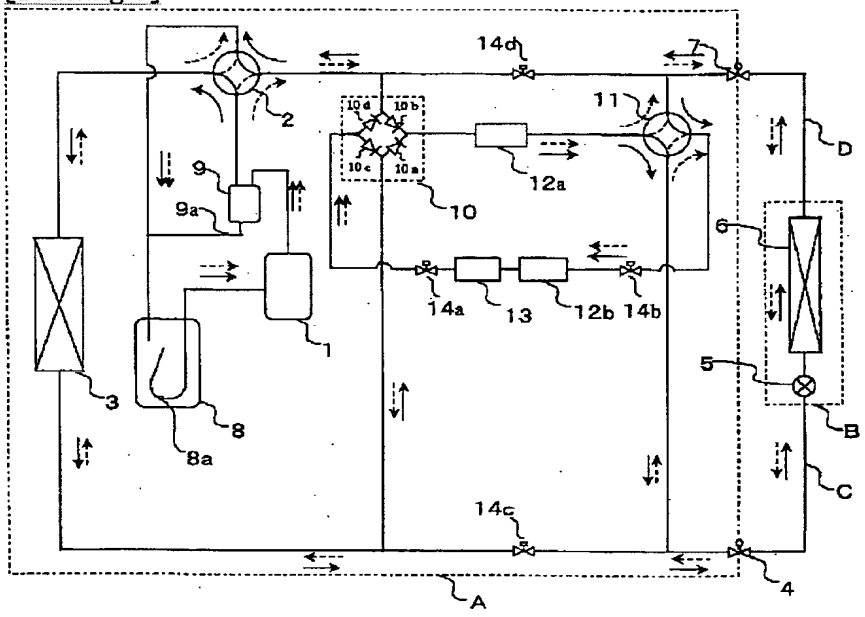
油分離器のガス流速と分離効率の関係

[Drawing 12]

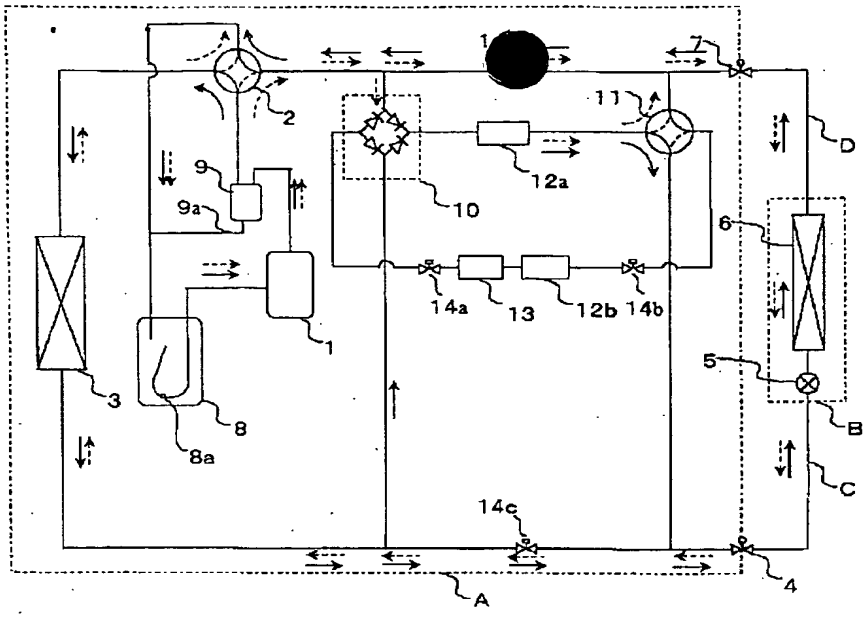


鉱油混入時のHFC用冷凍機油とへHFC冷媒(R407C)との溶解性
(臨界溶解度曲線)

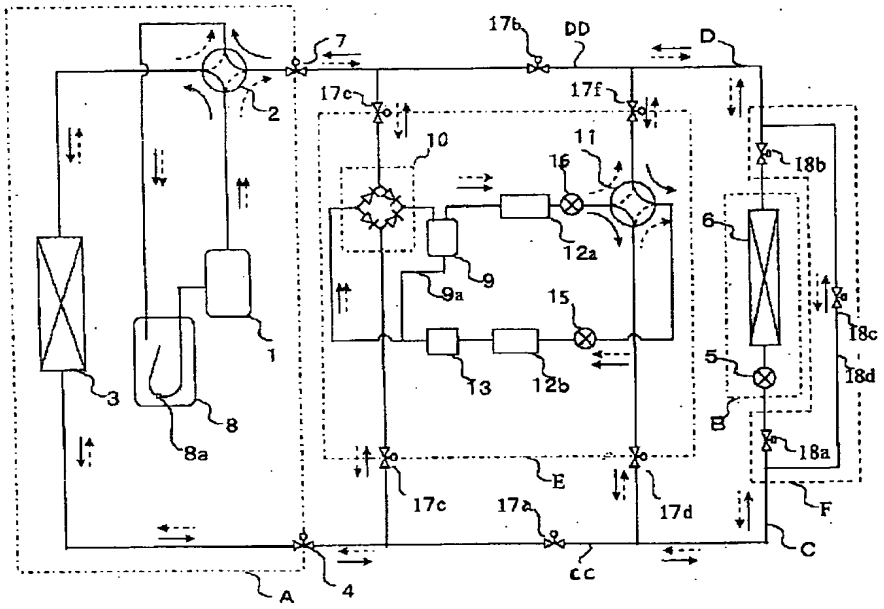
[Drawing 7]



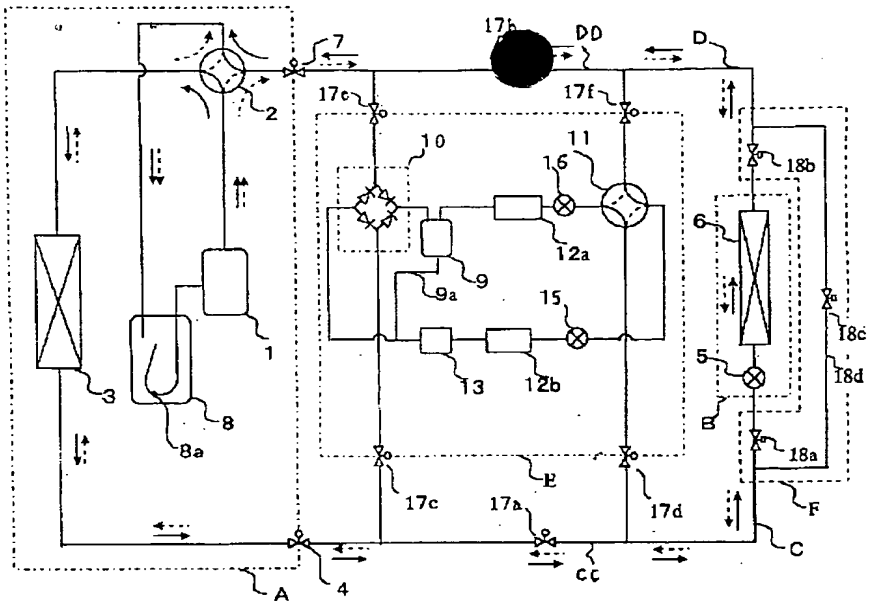
[Drawing 8]



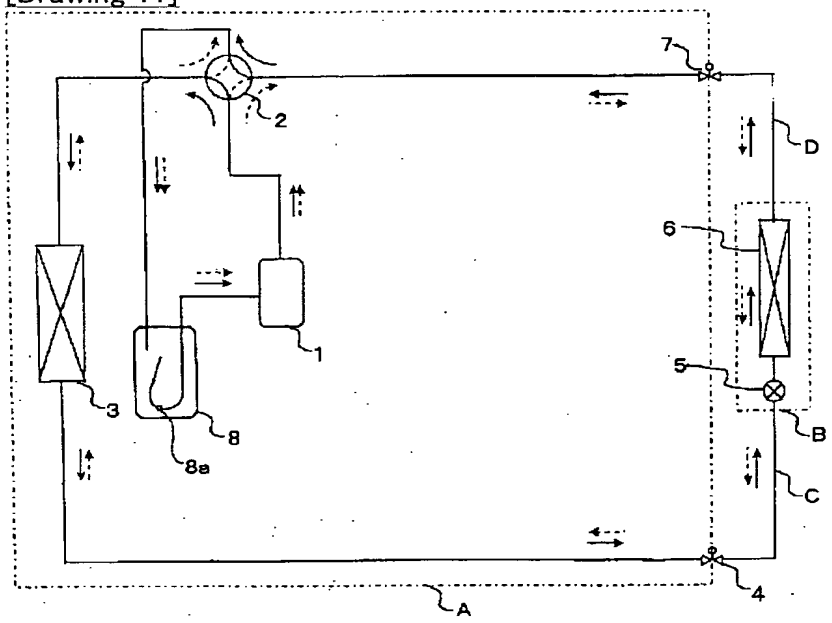
[Drawing 9]



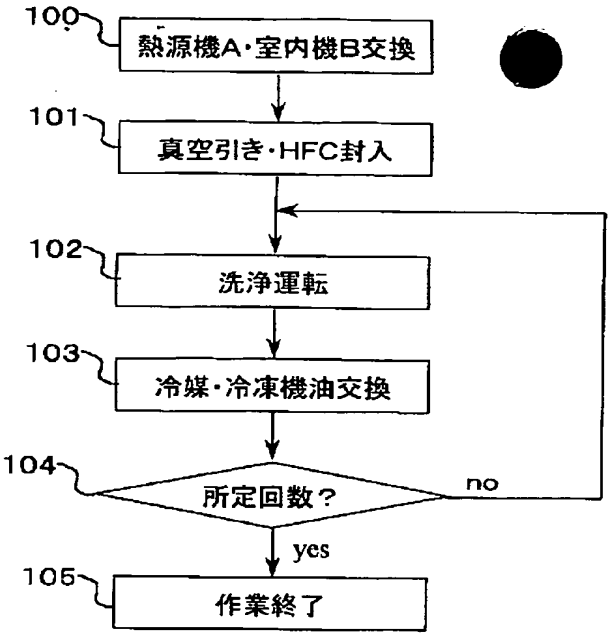
[Drawing 10]



[Drawing 11]



[Drawing 13]



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最終頁に続く

(54)【発明の名称】　冷凍サイクル装置及びその形成方法並びに冷凍サイクル装置の室外機

(57)【特許請求の範囲】

【請求項１】　ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源側熱交換器と流量調整器と利用側熱交換器を順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路を備えた冷凍サイクル装置であって、上記利用側熱交換器と上記圧縮機との間に、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とする冷凍サイクル装置。

【請求項２】　ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源機側熱交換器と流量調整器と利用側熱交換器とアキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路を備えた冷凍サイクル装置であって、

上記利用側熱交換器と上記アキュムレータとの間に、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とする冷凍サイクル装置。

【請求項３】　ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源機側熱交換器と流量調整器と利用側熱交換器とアキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路を備えた冷凍サイクル装置であって、

上記利用側熱交換器と上記アキュムレータとの間の冷媒回路をバイパスするとともに、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を有する第１バイパス路を備えたこと

を特徴とする冷凍サイクル装置。

【請求項４】　上記第１の冷媒回路の上記熱源機側熱交換器と上記流量調整器との間の冷媒回路をバイパスするとともに、冷媒の冷却手段を有する第２バイパス路を備え、

さらに、上記第１バイパス路の上記異物捕捉手段の上流側に冷媒の加熱手段を備えたことを特徴とする請求項３に記載の冷凍サイクル装置。

【請求項５】　上記第１バイパス路の上記加熱手段の上流側に第１流量制御手段を備え、さらに、上記第２バイパス路の上記冷却手段の下流側に第２流量制御手段を備えたことを特徴とする請求項４に記載の冷凍サイクル装置。

【請求項６】　上記第１の冷媒回路の上記圧縮機と上記熱源機側熱交換器との間に、冷媒の油成分を分離する油分離手段を備えたことを特徴とする請求項１～５のいずれかに記載の冷凍サイクル装置。

【請求項７】　上記第１の冷媒回路の上記熱源機側熱交換器と上記流量調整器との間の冷媒回路をバイパスするとともに、冷媒の油成分を分離する油分離手段を有する第３バイパス路を備えたことを特徴とする請求項３に記載の冷凍サイクル装置。

【請求項８】　上記第２バイパス路の上記冷却手段の上流側に冷媒の油成分を分離する油分離手段を備えたことを特徴とする請求項４に記載の冷凍サイクル装置。

【請求項９】　ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源機側熱交換器と流量調整器と利用側熱交換器とを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路と、上記圧縮機から上記利用側熱交換器と上記流量調整器と上記熱源機側熱交換器とを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第２の冷媒回路とを備えた冷凍サイクル装置であって、

上記第１の冷媒回路の上記利用側熱交換器と上記圧縮機との間で、かつ、上記第２の冷媒回路の上記熱源機側熱交換器と上記圧縮機との間に、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とする冷凍サイクル装置。

【請求項１０】　ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源機側熱交換器と流量調整器と利用側熱交換器とアキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路と、上記圧縮機から上記利用側熱交換器と上記流量調整器と上記熱源機側熱交換器と上記アキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第２の冷媒回路とを備えた冷凍サイクル装置であって、

上記第１の冷媒回路の上記利用側熱交換器と上記アキュムレータとの間で、かつ、上記第２の冷媒回路の上記熱源機側熱交換器と上記アキュムレータとの間に、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とする冷凍サイクル装置。

【請求項１１】　ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源機側熱交換器と流量調整器と利用側熱交換器とアキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路と、上記圧縮機から上記利用側熱交換器と上記流量調整器と上記熱源機側熱交換器と上記アキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第２の冷媒回路とを備えた冷凍サイクル装置であって、

上記第１の冷媒回路の上記利用側熱交換器と上記アキュムレータとの間の冷媒回路をバイパスし、かつ、上記第２の冷媒回路の上記上記流量調整器と上記熱源機側熱交換器との間の冷媒回路をバイパスするとともに、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を有する第１バイパス路を備えたことを特徴とする冷凍サイクル装置。

【請求項１２】　上記第１の冷媒回路の上記熱源機側熱交換器と上記流量調整器との間の冷媒回路をバイパスし、かつ、上記第２の冷媒回路の上記圧縮機と上記利用側熱交換器との間の冷媒回路をバイパスするとともに、冷媒の冷却手段を有する第２バイパス路を備え、

さらに、上記第１バイパス路の上記異物捕捉手段の上流側に冷媒の加熱手段を備えたことを特徴とする請求項１１に記載の冷凍サイクル装置。

【請求項１３】　上記第１バイパス路の上記加熱手段の上流側に第１流量制御手段を備え、さらに、上記第２バイパス路の上記冷却手段の下流側に第２流量制御手段を備えたことを特徴とする請求項１２に記載の冷凍サイクル装置。

【請求項１４】　上記第１の冷媒回路の上記圧縮機と上記熱源機側熱交換器との間で、かつ、上記第２の冷媒回路の上記圧縮機と上記利用側熱交換器との間に、冷媒の油成分を分離する油分離手段を備えたことを特徴とする請求項９～１３のいずれかに記載の冷凍サイクル装置。

【請求項１５】　上記第１の冷媒回路の上記圧縮機と上記熱源機側熱交換器との間で、かつ、上記第２の冷媒回路の上記圧縮機と上記冷却手段との間に、冷媒の油成分を分離する油分離手段を備えたことを特徴とする請求項１２に記載の冷凍サイクル装置。

【請求項１６】　上記第１の冷媒回路の上記熱源機側熱交換器と上記流量調整器との間の冷媒回路をバイパスし、かつ、上記第２の冷媒回路の上記圧縮機と上記利用側熱交換器との間の冷媒回路をバイパスするとともに、冷媒の油成分を分離する油分離手段を有する第３バイパス路を備えたことを特徴とする請求項１１に記載の冷凍サイクル装置。

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【請求項１７】　上記第２バイパス路の上記冷却手段の上流側に冷媒の油成分を分離する油分離手段を備えたことを特徴とする請求項１２に記載の冷凍サイクル装置。

【請求項１８】　上記流量調整器と上記利用側熱交換器とをバイパス制御できる室内機バイパス路を備えたことを特徴とする請求項１～１７のいずれかに記載の冷凍サイクル装置。

【請求項１９】　上記油分離手段により分離された油成分を上記異物捕捉手段より下流側で上記アキュムレータに戻す還流路を備えたことを特徴とする請求項７～８、１４～１７のいずれかに記載の冷凍サイクル装置。

【請求項２０】　上記第２バイパス路の上記油分離手段の下流側に冷媒に鉱油を注入する鉱油注入手段を備えたことを特徴とする請求項５または１２に記載の冷凍サイクル装置。

【請求項２１】　上記第２バイパス路の上記油分離手段の下流側に冷媒に水を注入する水注入手段を備えたことを特徴とする請求項５または１２に記載の冷凍サイクル装置。

【請求項２２】　上記冷媒回路に冷媒中の水分を吸着する水分吸着手段を備えたことを特徴とする請求項２１に記載の冷凍サイクル装置。

【請求項２３】　上記異物捕捉手段は、上記冷媒回路の一部で冷媒の流速を低下させて冷媒中の異物を分離するようにしたことを特徴とする請求項１～１７のいずれかに記載の冷凍サイクル装置。

【請求項２４】　上記異物捕捉手段は、冷媒を鉱油中に通すことにより冷媒中の異物を捕捉するようにしたことを特徴とする請求項１～１７のいずれかに記載の冷凍サイクル装置。

【請求項２５】　上記異物捕捉手段は、冷媒を鉱油中に通すことにより冷媒中のＣＦＣ及びＨＣＦＣを溶解するようにしたことを特徴とする請求項１～１７に記載の冷凍サイクル装置。

【請求項２６】　上記異物捕捉手段は、冷媒をフィルタに通すことにより冷媒中の異物を捕捉するようにしたことを特徴とする請求項１～１６のいずれかに記載の冷凍サイクル装置。

【請求項２７】　上記異物捕捉手段は、冷媒をイオン交換樹脂に通すことにより冷媒中の塩素イオンを捕捉するようにしたことを特徴とする請求項１～１７のいずれかに記載の冷凍サイクル装置。

【請求項２８】　上記第１バイパス路、第２バイパス路、又は第３バイパス路を上記冷媒回路から切り離し自在に設けたことを特徴とする請求項３，４，７，１１，１２，１６のいずれかに記載の冷凍サイクル装置。

【請求項２９】　圧縮機、熱源機側熱交換器、アキュムレータを有する熱源機と、流量調整器、利用側熱交換器を有する室内機とを備え、ＣＦＣ冷媒やＨＣＦＣ冷媒で使用していた第１の接続配管と第２の接続配管を再利用し、上記第１の接続配管と第２の接続配管で熱源機と室内機とを接続したＨＦＣ冷媒を使用する冷凍サイクル装置であって、上記第１の接続配管と第２の接続配管とに残留する鉱油を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とする冷凍サイクル装置。

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【請求項３０】　圧縮機、熱源機側熱交換器、アキュムレータを有する熱源機と、流量調整器、利用側熱交換器を有する室内機とを備え、ＣＦＣ冷媒やＨＣＦＣ冷媒で使用していた第１の接続配管と第２の接続配管を再利用し、上記第１の接続配管と第２の接続配管で熱源機と室内機とを接続したＨＦＣ冷媒を使用する冷凍サイクル装置であって、上記第１の接続配管と第２の接続配管とに残留する固形異物及び液体異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とする冷凍サイクル装置。

【請求項３１】　圧縮機、熱源機側熱交換器、アキュムレータを有する熱源機と、流量調整器、利用側熱交換器を有する室内機とを備え、ＣＦＣ冷媒やＨＣＦＣ冷媒で使用していた第１の接続配管と第２の接続配管を再利用し、上記第１の接続配管と第２の接続配管で熱源機と室内機とを接続したＨＦＣ冷媒を使用する冷凍サイクル装置であって、上記第１の接続配管と第２の接続配管とに残留する残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とする冷凍サイクル装置。

【請求項３２】　圧縮機から熱源機側熱交換器と流量調整器と利用側熱交換器とアキュムレータとを順次に経て上記圧縮機に冷媒を循環させる第１の冷媒回路と、上記圧縮機から上記利用側熱交換器と上記流量調整器と上記熱源機側熱交換器と上記アキュムレータとを順次に経て上記圧縮機に冷媒を循環させる第２の冷媒回路とを備え、＜第１の冷媒＞ＣＦＣ冷媒またはＨＣＦＣ冷媒を用いる既存の冷凍サイクル装置において、

上記圧縮機と上記熱源機側熱交換器と上記流量調整器と上記利用側熱交換器と上記アキュムレータとを＜第２の冷媒＞ＨＦＣ冷媒を用いるものに置換するとともに、上記流量調整器及び上記利用側熱交換器に接続された既存の冷媒配管を用いて請求項１～３１のいずれかに記載の冷凍サイクル装置を形成することを特徴とする冷凍サイクル装置の形成方法。

【請求項３３】　圧縮機と熱源側熱交換器を含む室外機と、流量調整器と利用側熱交換器を含む室内機とを、ＣＦＣ冷媒やＨＣＦＣ冷媒で使用していた第１の配管と第２の配管で接続して構成する冷凍サイクル装置の室外機において、該室外機に内蔵された冷媒配管に、上記第１の配管および第２の配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とする冷凍サイクル装置の室外機。

【請求項３４】　圧縮機と四方弁と熱源側熱交換器を含

む室外機と、流量調整器と利用側熱交換器を含む室内機とを、ＣＦＣ冷媒やＨＣＦＣ冷媒で使用していた第１の配管と第２の配管で接続して構成する冷凍サイクル装置の室外機において、上記四方弁と上記圧縮機との間の冷媒配管に、上記第１の配管および第２の配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とする冷凍サイクル装置の室外機。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、冷凍サイクル装置の冷媒の交換に関するものである。さらに詳しくは、熱源機と室内機のみを新規に交換し、熱源機と室内機とを接続する接続配管を交換しないで、冷媒を新規に交換する冷凍サイクル装置とその交換方法及び運転方法に関するものである。

【０００２】

【従来の技術】従来から一般に用いられているセパレート形の空気調和装置を図１１に示す。図１１において、Ａは熱源機であり、圧縮機１、四方弁２、熱源機側熱交換器３、第１の操作弁４、第２の操作弁７、アキュムレータ８を内蔵している。Ｂは室内機であり、流量調整器５（あるいは流量制御弁５）、及び利用側熱交換器６を備えている。熱源機Ａと室内機Ｂは離れた場所に設置され、第１の接続配管Ｃ、第２の接続配管Ｄにより接続されて、冷凍サイクルを形成する。

【０００３】第１の接続配管Ｃの一端は熱源機側熱交換器３と第１の操作弁４を介して接続され、第１の接続配管Ｃの他の一端は流量調整器５と接続されている。第２の接続配管Ｄの一端は四方弁２と第２の操作弁７を介して接続され、第２の接続配管Ｄの他の一端は利用側熱交換器６と接続されている。また、アキュムレータ８のＵ字管状の流出配管の下部には返油穴８ａが設けられている。

【０００４】この空気調和装置の冷媒の流れを図１１に添って説明する。図中、実線矢印が冷房運転の流れを、破線矢印が暖房運転の流れを示す。まず、冷房運転の流れを説明する。圧縮機１で圧縮された高温高圧のガス冷媒は四方弁２を経て、熱源機側熱交換器３へと流入し、ここで空気・水など熱源媒体と熱交換して凝縮液化する。凝縮液化した冷媒は第１の操作弁４、第１の接続配管Ｃを経て流量調整器５へ流入し、ここで低圧まで減圧されて低圧二相状態となり、利用側熱交換器６で空気などの利用側媒体と熱交換して蒸発・ガス化する。　蒸発・ガス化した冷媒は第２の接続配管Ｄ、第２の操作弁７、四方弁２、アキュムレータ８を経て圧縮機１へ戻る。

【０００５】次に、暖房運転の流れを説明する。圧縮機１で圧縮された高温高圧のガス冷媒は四方弁２、第２の操作弁７、第２の接続配管Ｄを経て、利用側側熱交換器

６へと流入し、ここで空気など利用側媒体と熱交換して凝縮液化する。凝縮液化した冷媒は流量調整器５へ流入し、ここで低圧まで減圧されて低圧二相状態となり、第１の接続配管Ｃ、第１の操作弁４を経て、熱源機側熱交換器３で空気・水などの熱源媒体と熱交換して蒸発・ガス化する。蒸発・ガス化した冷媒は四方弁２、アキュムレータ８を経て圧縮機１へ戻る。

【０００６】従来、このような空気調和装置の冷媒として、ＣＦＣ（クロロフルオロカーボン）やＨＣＦＣ（ハイドロクロロフルオロカーボン）が用いられてきたが、これらの分子に含まれる塩素が成層圏でオゾン層を破壊するため、ＣＦＣは既に全廃され、ＨＣＦＣも生産規制が開始されている。

【０００７】これらに替わって、分子に塩素を含まないＨＦＣ（ハイドロフルオロカーボン）を使用する空気調和装置が実用化されている。ＣＦＣやＨＣＦＣを用いた空気調和装置が老朽化した場合、これらの冷媒は全廃・生産規制されているため、ＨＦＣを用いた空気調和装置に入れ替える必要がある。熱源機Ａと室内機Ｂは、ＨＦＣで使用する冷凍機油・有機材料・熱交換器がＨＣＦＣとは異なるため、ＨＦＣ専用のものと交換する必要があり、かつ元々ＣＦＣ・ＨＣＦＣ用の熱源機Ａと室内機Ｂは老朽化しているため交換する必要があるものであり、交換も比較的容易である。

【０００８】一方、熱源機Ａと室内機Ｂを接続する第１の接続配管Ｃと第２の接続配管Ｄは配管長が長い場合や、パイプシャフトや天井裏など建物に埋設されている場合には、新規配管に交換することは困難で、しかも老朽化もしないため、ＣＦＣやＨＣＦＣを用いた空気調和装置で使用していた第１の接続配管Ｃと第２の接続配管Ｄをそのまま使用できれば、配管工事が簡略化できる。

【０００９】しかし、ＣＦＣやＨＣＦＣを用いた空気調和装置で使用していた第１の接続配管Ｃと第２の接続配管Ｄには、ＣＦＣやＨＣＦＣを用いた空気調和装置の冷凍機油である鉱油やＣＦＣ・ＨＣＦＣや冷凍機油の劣化物がスラッジとなったものが残留している。

【００１０】図１２は、鉱油混入時のＨＦＣ用冷凍機油とＨＦＣ冷媒（Ｒ４０７Ｃ）との溶解性を示す臨界溶解度曲線を示す図で、横軸は油量（ｗｔ％）、縦軸は温度（℃）を示す。ＨＦＣを用いた空気調和装置の冷凍機油（エステル油やエーテル油などの合成油）に鉱油が一定量以上混入すると図１２に示すように、ＨＦＣ冷媒との相溶性が失われ、アキュムレータ８に液冷媒が溜まっている場合にＨＦＣ用冷凍機油が液冷媒の上に分離・浮遊するため、アキュムレータ８の下部にある返油穴８ａから圧縮機へ冷凍機油が戻らず圧縮機の摺動部が焼き付く。また、鉱油が混入するとＨＦＣ用冷凍機油が劣化する。また、ＣＦＣ・ＨＣＦＣが混入するとこれらに含まれる塩素成分によりＨＦＣ用冷凍機油が劣化する。また、ＣＦＣ・ＨＣＦＣ用冷凍機油の劣化物がスラッジと

なったものに含まれる塩素成分によりＨＦＣ用冷凍機油が劣化する。

【００１１】このため、従来はＣＦＣやＨＣＦＣを用いた空気調和装置で使用していた第１の接続配管Ｃと第２の接続配管Ｄを、洗浄装置を用いて専用の洗浄液（ＨＣＦＣ１４１ｂやＨＣＦＣ２２５）で洗浄することが行われている（以下、これを洗浄方法１と称する）。また、特開平7-83545号公報に開示された方法がある。これは、図１３に示すように、洗浄装置を用いずに、ＨＦＣ用熱源機Ａ、ＨＦＣ用室内機Ｂ、第１の接続配管Ｃ、第２の接続配管Ｄを接続し（ステップ１００）、ＨＦＣ、ＨＦＣ用冷凍機油を充填した後に（ステップ１０１）運転することで洗浄し（ステップ１０２）、その後で空気調和装置内の冷媒と冷凍機油を回収し新しい冷媒と冷凍機油を充填してから（ステップ１０３）、再度運転による洗浄を実施する、ということを所定回数繰り返す（ステップ１０４、１０５）ことが、提案されている（以下、これを洗浄方法２と称する）。

【００１２】

【発明が解決しようとする課題】上記した従来の洗浄方法１では以下に示すような問題があった。第１に、使用する洗浄液がＨＣＦＣであり、オゾン層破壊係数がゼロでないため、空気調和装置の冷媒をＨＣＦＣからＨＦＣへと代替することと矛盾する。特に、ＨＣＦＣ１４１ｂはオゾン破壊係数が０．１１と大きく問題である。

【００１３】第２に、使用する洗浄液は可燃性・毒性が完全に安全なものではないことがあげられる。ＨＣＦＣ１４１ｂは可燃性で、低毒性である。ＨＣＦＣ２２５は不燃だが、低毒性である。第３に、沸点が高く（ＨＣＦＣ１４１ｂは３２℃、ＨＣＦＣ２２５は５１．１～５６．１℃）、外気温度がこの沸点より低い場合、特に冬期には、洗浄後に洗浄液が液状態で、第１の接続配管Ｃと第２の接続配管Ｄに残留する。これら洗浄液はＨＣＦＣであることから、塩素成分を含んでおり、ＨＦＣ用冷凍機油が劣化する。

【００１４】第４に、洗浄液は環境上全量回収する必要があり、かつ上記第３の問題点が発生しないように高温の窒素ガスなどで再洗浄するなど、洗浄工事の手間がかかる。

【００１５】また、上記の従来の洗浄方法２では、以下に示すような問題があった。第１に、ＨＦＣ冷媒による洗浄が、特開平7-83545号公報の実施例では３回必要であり、また各洗浄運転で使用したＨＦＣ冷媒は不純物を含むため、回収後その場での再利用は不可能である。つまり、通常の充填冷媒量の３倍の冷媒が必要であり、コスト・環境上問題である。

【００１６】第２に、冷凍機油も各洗浄運転後に入れ替えるため、通常の充填冷凍機油量の３倍の冷凍機油が必要であり、コスト・環境上問題である。また、ＨＦＣ用冷凍機油はエステル油またはエーテル油であり、吸湿性が高いため、交換用冷凍機油の水分管理も必要となる。また、冷凍機油を、洗浄する人間が封入するため、過不足が生じる危険性もあり、その後の運転において支障を来す可能性がある（過充填時は油圧縮による圧縮部破壊、モータ過熱をきたし、不足充填時は潤滑不良をきたす）。

【００１７】この発明は、上述のような従来の課題を解決するためになされたもので、環境保護上問題のあるとされる冷媒を用いた既設の冷凍サイクル装置を、環境保護上問題のないとされる冷媒に置換する冷凍サイクル装置と、その置換方法ならびに運転方法を提供しようとするものである。

【００１８】

【課題を解決するための手段】本願の請求項１の発明による冷凍サイクル装置は、ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源側熱交換器と流量調整器と利用側熱交換器を順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路を備えた冷凍サイクル装置であって、上記利用側熱交換器と上記圧縮機との間に、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とするものである。本願の請求項２の発明による冷凍サイクル装置は、ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源機側熱交換器と流量調整器と利用側熱交換器とアキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路を備えた冷凍サイクル装置であって、上記利用側熱交換器と上記アキュムレータとの間に、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とするものである。

【００１９】請求項３の発明による冷凍サイクル装置は、ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源機側熱交換器と流量調整器と利用側熱交換器とアキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路を備えた冷凍サイクル装置であって、上記利用側熱交換器と上記アキュムレータとの間の冷媒回路をバイパスするとともに、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を有する第１バイパス路を備えたことを特徴とするものである。

【００２０】請求項４の発明による冷凍サイクル装置は、上記第１の冷媒回路の上記熱源機側熱交換器と上記流量調整器との間の冷媒回路をバイパスするとともに、冷媒の冷却手段を有する第２バイパス路を備え、さらに、上記第１バイパス路の上記異物捕捉手段の上流側に冷媒の加熱手段を備えたことを特徴とするものである。

【００２１】請求項５の発明による冷凍サイクル装置

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は、上記第１バイパス路の上記加熱手段の上流側に第１流量制御手段を備え、さらに、上記第２バイパス路の上記冷却手段の下流側に第２流量制御手段を備えたことを特徴とするものである。

【００２２】

【００２３】

【００２４】請求項６の発明による冷凍サイクル装置は、上記第１の冷媒回路の上記圧縮機と上記熱源機側熱交換器との間に、冷媒の油成分を分離する油分離手段を備えたことを特徴とするものである。

【００２５】請求項７の発明による冷凍サイクル装置は、上記第１の冷媒回路の上記熱源機側熱交換器と上記流量調整器との間の冷媒回路をバイパスするとともに、冷媒の油成分を分離する油分離手段を有する第３バイパス路を備えたことを特徴とするものである。

【００２６】請求項８の発明による冷凍サイクル装置は、上記第２バイパス路の上記冷却手段の上流側に冷媒の油成分を分離する油分離手段を備えたことを特徴とするものである。

【００２７】請求項９の発明による冷凍サイクル装置は、ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源機側熱交換器と流量調整器と利用側熱交換器とを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路と、上記圧縮機から上記利用側熱交換器と上記流量調整器と上記熱源機側熱交換器とを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第２の冷媒回路とを備えた冷凍サイクル装置であって、上記第１の冷媒回路の上記利用側熱交換器と上記圧縮機との間で、かつ、上記第２の冷媒回路の上記熱源機側熱交換器と上記圧縮機との間に、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とするものである。請求項１０の発明による冷凍サイクル装置は、ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源機側熱交換器と流量調整器と利用側熱交換器とアキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路と、上記圧縮機から上記利用側熱交換器と上記流量調整器と上記熱源機側熱交換器と上記アキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第２の冷媒回路とを備えた冷凍サイクル装置であって、上記第１の冷媒回路の上記利用側熱交換器と上記アキュムレータとの間で、かつ、上記第２の冷媒回路の上記熱源機側熱交換器と上記アキュムレータとの間に、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とするものである。

【００２８】請求項１１の発明による冷凍サイクル装置は、ＣＦＣ冷媒やＨＣＦＣ冷媒の冷凍サイクル装置で使用した接続配管を再利用し、圧縮機から熱源機側熱交換

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器と流量調整器と利用側熱交換器とアキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第１の冷媒回路と、上記圧縮機から上記利用側熱交換器と上記流量調整器と上記熱源機側熱交換器と上記アキュムレータとを順次に経て上記圧縮機にＨＦＣ冷媒を循環させる第２の冷媒回路とを備えた冷凍サイクル装置であって、上記第１の冷媒回路の上記利用側熱交換器と上記アキュムレータとの間の冷媒回路をバイパスし、かつ、上記第２の冷媒回路の上記上記流量調整器と上記熱源機側熱交換器との間の冷媒回路をバイパスするとともに、上記接続配管に残留していた残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を有する第１バイパス路を備えたことを特徴とするものである。

【００２９】請求項１２の発明による冷凍サイクル装置は、上記第１の冷媒回路の上記熱源機側熱交換器と上記流量調整器との間の冷媒回路をバイパスし、かつ、上記第２の冷媒回路の上記圧縮機と上記利用側熱交換器との間の冷媒回路をバイパスするとともに、冷媒の冷却手段を有する第２バイパス路を備え、さらに、上記第１バイパス路の上記異物捕捉手段の上流側に冷媒の加熱手段を備えたことを特徴とするものである。

【００３０】請求項１３の発明による冷凍サイクル装置は、上記第１バイパス路の上記加熱手段の上流側に第１流量制御手段を備え、さらに、上記第２バイパス路の上記冷却手段の下流側に第２流量制御手段を備えたことを特徴とするものである。

【００３１】

【００３２】

【００３３】請求項１４の発明による冷凍サイクル装置は、上記第１の冷媒回路の上記圧縮機と上記熱源機側熱交換器との間で、かつ、上記第２の冷媒回路の上記圧縮機と上記利用側熱交換器との間に、冷媒の油成分を分離する油分離手段を備えたことを特徴とするものである。

【００３４】請求項１５の発明による冷凍サイクル装置は、上記第１の冷媒回路の上記圧縮機と上記熱源機側熱交換器との間で、かつ、上記第２の冷媒回路の上記圧縮機と上記冷却手段との間に、冷媒の油成分を分離する油分離手段を備えたことを特徴とするものである。

【００３５】請求項１６の発明による冷凍サイクル装置は、上記第１の冷媒回路の上記熱源機側熱交換器と上記流量調整器との間の冷媒回路をバイパスし、かつ、上記第２の冷媒回路の上記圧縮機と上記利用側熱交換器との間の冷媒回路をバイパスするとともに、冷媒の油成分を分離する油分離手段を有する第３バイパス路を備えたことを特徴とするものである。

【００３６】請求項１７の発明による冷凍サイクル装置は、上記第２バイパス路の上記冷却手段の上流側に冷媒の油成分を分離する油分離手段を備えたことを特徴とするものである。

【００３７】請求項１８の発明による冷凍サイクル装置

は、上記流量調整器と上記利用側熱交換器とをバイパス制御できる室内機バイパス路を備えたことを特徴とするものである。

【００３８】請求項１９の発明による冷凍サイクル装置は、上記油分離手段により分離された油成分を上記異物捕捉手段より下流側で上記アキュムレータに戻す還流路を備えたことを特徴とするものである。

【００３９】請求項２０の発明による冷凍サイクル装置は、上記第２バイパス路の上記油分離手段の下流側に冷媒に鉱油を注入する鉱油注入手段を備えたことを特徴とするものである。

【００４０】請求項２１の発明による冷凍サイクル装置は、上記第２バイパス路の上記油分離手段の下流側に冷媒に水を注入する水注入手段を備えたことを特徴とするものである。

【００４１】請求項２２の発明による冷凍サイクル装置は、上記冷媒回路に冷媒中の水分を吸着する水分吸着手段を備えたことを特徴とするものである。

【００４２】請求項２３の発明による冷凍サイクル装置は、上記異物捕捉手段は、上記冷媒回路の一部で冷媒の流速を低下させて冷媒中の異物を分離するようにしたことを特徴とするものである。

【００４３】請求項２４の発明による冷凍サイクル装置は、上記異物捕捉手段は、冷媒を鉱油中に通すことにより冷媒中の異物を捕捉するようにしたことを特徴とするものである。

【００４４】請求項２５の発明による冷凍サイクル装置は、上記異物捕捉手段は、冷媒を鉱油中に通すことにより冷媒中のＣＦＣ及びＨＣＦＣを溶解するようにしたことを特徴とするものである。

【００４５】請求項２６の発明による冷凍サイクル装置は、上記異物捕捉手段は、冷媒をフィルタに通すことにより冷媒中の異物を捕捉するようにしたことを特徴とするものである。

【００４６】請求項２７の発明による冷凍サイクル装置は、上記異物捕捉手段は、冷媒をイオン交換樹脂に通すことにより冷媒中の塩素イオンを捕捉するようにしたことを特徴とするものである。

【００４７】請求項２８の発明による冷凍サイクル装置は、上記第１バイパス路、第２バイパス路、又は第３バイパス路を上記冷媒回路から切り離し自在に設けたことを特徴とするものである。

【００４８】請求項２９の発明による冷凍サイクル装置は、圧縮機、熱源機側熱交換器、アキュムレータを有する熱源機と、流量調整器、利用側熱交換器を有する室内機とを備え、ＣＦＣ冷媒やＨＣＦＣ冷媒で使用していた第１の接続配管と第２の接続配管を再利用し、上記第１の接続配管と第２の接続配管で熱源機と室内機とを接続したＨＦＣ冷媒を使用する冷凍サイクル装置であって、上記第１の接続配管と第２の接続配管とに残留する鉱油を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とするものである。請求項３０の発明による冷凍サイクル装置は、圧縮機、熱源機側熱交換器、アキュムレータを有する熱源機と、流量調整器、利用側熱交換器を有する室内機とを備え、ＣＦＣ冷媒やＨＣＦＣ冷媒で使用していた第１の接続配管と第２の接続配管を再利用し、上記第１の接続配管と第２の接続配管で熱源機と室内機とを接続したＨＦＣ冷媒を使用する冷凍サイクル装置であって、上記第１の接続配管と第２の接続配管とに残留する固形異物及び液体異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とするものである。請求項３１の発明による冷凍サイクル装置は、圧縮機、熱源機側熱交換器、アキュムレータを有する熱源機と、流量調整器、利用側熱交換器を有する室内機とを備え、ＣＦＣ冷媒やＨＣＦＣ冷媒で使用していた第１の接続配管と第２の接続配管を再利用し、上記第１の接続配管と第２の接続配管で熱源機と室内機とを接続したＨＦＣ冷媒を使用する冷凍サイクル装置であって、上記第１の接続配管と第２の接続配管とに残留する残留異物を流入してきた上記ＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とするものである。

【００４９】また、請求項３２の発明による冷凍サイクル装置の形成方法は、圧縮機から熱源機側熱交換器と流量調整器と利用側熱交換器とアキュムレータとを順次に経て上記圧縮機に冷媒を循環させる第１の冷媒回路と、上記圧縮機から上記利用側熱交換器と上記流量調整器と上記熱源機側熱交換器と上記アキュムレータとを順次に経て上記圧縮機に冷媒を循環させる第２の冷媒回路とを備え、ＣＦＣ冷媒またはＨＣＦＣ冷媒を用いる既存の冷凍サイクル装置において、上記圧縮機と上記熱源機側熱交換器と上記流量調整器と上記利用側熱交換器と上記アキュムレータとをＨＦＣ冷媒を用いるものに置換するとともに、上記流量調整器及び上記利用側熱交換器に接続された既存の冷媒配管を用いて請求項１～３１のいずれかに記載の冷凍サイクル装置を形成することを特徴とするものである。

【００５０】

【００５１】また、請求項３４の発明による冷凍サイクル装置の室外機は、圧縮機と熱源側熱交換器を含む室外機と、流量調整器と利用側熱交換器を含む室内機とを、冷媒配管で接続して構成する冷凍サイクル装置の室外機において、該室外機に内蔵された冷媒配管に、上記接続配管に残留していた残留異物を流入してきた上記ＣＦＣ冷媒中から捕捉する異物捕捉手段を備えたことを特徴とするものである。

【００５２】また、請求項３５の発明による冷凍サイクル装置の室外機は、圧縮機と四方弁と熱源側熱交換器を含む室外機と、流量調整器と利用側熱交換器を含む室内機とを、冷媒配管で接続して構成する冷凍サイクル装置

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の室外機において、上記四方弁と上記圧縮機との間の上記冷媒配管に、上記接続配管に残留していた残留異物を流入してきた上記ＣＦＣ冷媒中から捕捉するを捕獲する異物捕捉手段を備えたことを特徴とするとするものである。

【００５３】

【００５４】

【００５５】

【００５６】

【００５７】

【００５８】

【００５９】

【発明の実施の形態】以下、図面を参照してこの発明の実施の形態について説明する。なお、各図中、同一又は相当する部分には、同一符号を付して説明を省略または簡略化する。

実施の形態１．図１は、この発明の実施の形態１による冷凍サイクル装置の一例として、空気調和装置の冷媒回路を示す図である。図１において、Ａは熱源機であり、圧縮機１、四方弁２、熱源機側熱交換器３、第１の操作弁４、第２の操作弁７、アキュムレータ８、油分離器９（油分離手段）、及び異物捕捉手段１３を内蔵している。

【００６０】油分離器９は、圧縮機１の吐出配管に設けられ、圧縮機１から冷媒とともに吐出される冷凍機油を分離する。異物捕捉手段１３は、四方弁２とアキュムレータ８の間に設けられている。９ａは油分離器９の底部より端を発し、異物捕捉手段１３の出口より下流側に至るバイパス路である。また、アキュムレータ８のＵ字管状の流出配管の下部には返油穴８ａが設けられている。Ｂは室内機であり、流量調整器５（あるいは流量調整弁５）、及び利用側熱交換器６を備えている。

【００６１】Ｃは、第１の接続配管であり、その一端は熱源機側熱交換器３と第１の操作弁４を介して接続され、他の一端は流量調整器５と接続されている。Ｄは、第２の接続配管であり、その一端は四方弁２と第２の操作弁７を介して接続され、他の一端は利用側熱交換器６と接続されている。熱源機Ａと室内機Ｂは離れた場所に設置され、第１の接続配管Ｃ、第２の接続配管Ｄにより接続されて、冷凍サイクルを形成する。なお、この空気調和装置は冷媒としてＨＦＣを使うものである。

【００６２】次に、ＣＦＣやＨＣＦＣを使った空気調和装置が老朽化した場合の、空気調和装置交換の手順を示す。ＣＦＣまたはＨＣＦＣを回収し、熱源機Ａと室内機Ｂを図１に示すものと交換する。第１の接続配管Ｃと第２の接続配管ＤはＨＣＦＣを使った空気調和装置のものを再利用する。熱源機Ａには予めＨＦＣが充填されているので、第１の操作弁４と第２の操作弁７は閉じたまま、室内機Ｂ、第１の接続配管Ｃ、第２の接続配管Ｄを接続状態で真空引きをし、その後第１の操作弁４と第２の操作弁７の開弁とＨＦＣの追加充填を実施する。その後、通常の空調運転兼洗浄運転を実施する。

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【００６３】次に、通常の空調運転兼洗浄運転の内容を図１に添って説明する。図中実線矢印が冷房運転の流れを、破線矢印が暖房運転の流れを示す。まず冷房運転について説明する。圧縮機１で圧縮された高温高圧のガス冷媒はＨＦＣ用冷凍機油と共に圧縮機１を吐出され、油分離器９へ流入する。

【００６４】ここで、ＨＦＣ用の冷凍機油は完全に分離され、ガス冷媒のみが、四方弁２を経て、熱源機側熱交換器３へと流入し、ここで空気・水など熱源媒体と熱交換器して凝縮液化する。凝縮液化した冷媒は第１の操作弁４を経て第１の接続配管Ｃに流入する。ＨＦＣの液冷媒が第１の接続配管Ｃを流れるときに、第１の接続配管Ｃに残留しているＣＦＣ・ＨＣＦＣ・鉱油・鉱油劣化物（以下残留異物と称する）を少しずつ洗浄してＨＦＣの液冷媒と共に流れ、流量調整器５へ流入し、ここで低圧まで減圧されて低圧二相状態となり、利用側熱交換器６で空気などの利用側媒体と熱交換して蒸発・ガス化する。

【００６５】蒸発・ガス化した冷媒は、第１の接続配管Ｃの残留異物と共に第２の接続配管Ｄに流入する。第２の接続配管に残留している残留異物は、ここを流れる冷媒がガス状のため、配管内面に付着した残留異物の一部はガス冷媒中にミスト状になって流れるが、大半の液状の残留異物はガス冷媒の流速より遅い流速で、ガス・液境界面に発生するせん断力によりガス冷媒に引きずられる形で、配管内面を環状に流れるため、洗浄時間は第１の接続配管Ｃよりは遅いが、確実に洗浄される。

【００６６】その後、ガス冷媒は、第１の接続配管Ｃの残留異物と第２の接続配管Ｄの残留異物と共に、第２の操作弁７、四方弁２を経て異物捕捉手段１３へ流入する。残留異物は、沸点の違いにより相が異なり、固体異物・液体異物・気体異物の３種類に分類される。異物捕捉手段１３では、固体異物と液体異物は完全にガス冷媒と分離・捕捉される。気体異物はその一部が捕捉され、一部は捕捉されない。その後ガス冷媒は、異物捕捉手段１３で捕捉されなかった気体異物と共にアキュムレータ８を経て圧縮機１へ戻る。なお、冷房運転時の冷媒回路、すなわち、圧縮機１から熱源機側熱交換器３と流量調整器５と利用側熱交換器６とアキュムレータ８とを順次に経て再び圧縮機１に戻る冷媒回路を、本明細書では、第１の冷媒回路とする。

【００６７】油分離器９で、ガス冷媒と完全に分離されたＨＦＣ用冷凍機油は、バイパス路９ａを経て、異物捕捉手段１３の下流で本流と合流して、圧縮機１へ戻るので、第１の接続配管Ｃや第２の接続配管Ｄに残留していた鉱油と混ざることはなく、ＨＦＣ用冷凍機油はＨＦＣに対して非相溶化することはなく、またＨＦＣ用冷凍機油は鉱油により劣化することはない。

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【００６８】また、固形異物もＨＦＣ用冷凍機油と混合することはなく、ＨＦＣ用冷凍機油は劣化しない。また、気体異物はＨＦＣ冷媒が冷媒回路を１サイクル循環して、異物捕捉手段１３を１回通る間には一部が捕捉されるだけで、ＨＦＣ用冷凍機油と気体異物は混合されるが、ＨＦＣ用冷凍機油の劣化は化学反応で、急激には進まない。その一例を図２に示す。図２は、ＨＦＣ用冷凍機油に塩素が混入している場合（１７５℃）の劣化の時間変化を示す図で、横軸は時間（ｈｒ）、縦軸は全酸価（ｍｇＫＯＨ／ｇ）を示す。異物捕捉手段１３を１回通る間に捕捉されなかった気体異物は、ＨＦＣ冷媒の循環と共に何回も異物捕捉手段１３を通るので、ＨＦＣ用冷凍機油の劣化するよりも速く、異物捕捉手段１３で捕捉すればよい。

【００６９】次に暖房運転の流れを説明する。圧縮機１で圧縮された高温高圧のガス冷媒はＨＦＣ用冷凍機油と共に圧縮機１を吐出され、油分離器９へ流入する。ここで、ＨＦＣ用の冷凍機油は完全に分離され、ガス冷媒のみが四方弁２、第２の操作弁７を経て第２の接続配管Ｄへ流入する。

【００７０】第２の接続配管に残留している残留異物は、ここを流れる冷媒がガス状のため、配管内面に付着した残留異物の一部はガス冷媒中にミスト状になって流れるが、大半の液状の残留異物はガス冷媒の流速より遅い流速で、ガス・液境界面に発生するせん断力によりガス冷媒に引きずられる形で、配管内面を環状に流れるため、洗浄時間は冷房運転時における第１の接続配管Ｃよりは遅いが、確実に洗浄される。

【００７１】その後、ガス冷媒は、第２の接続配管Ｄの残留異物と共に、利用側側熱交換器６へと流入し、ここで空気など利用側媒体と熱交換して凝縮液化する。凝縮液化した冷媒は流量調整器５へ流入し、ここで低圧まで減圧されて低圧二相状態となり、第１の接続配管Ｃに流入する。気液二相状態のため、流速も速く、かつ液冷媒と共に、残留異物は洗浄され、冷房運転時の第１の接続配管より速い速度で洗浄される。

【００７２】第２の接続配管Ｄと第１の接続配管Ｃから洗浄された残留異物と共に、気液二相状態の冷媒は、第１の操作弁４を経て、熱源機側熱交換器３で空気・水などの熱源媒体と熱交換して蒸発・ガス化する。蒸発・ガス化した冷媒は四方弁２を経て異物捕捉手段１３に流入する。

【００７３】残留異物は、沸点の違いにより相が異なり、固体異物・液体異物・気体異物の３種類に分類される。異物捕捉手段１３では、固体異物と液体異物は完全にガス冷媒と分離・捕捉される。気体異物はその一部が捕捉され、一部は捕捉されない。その後、ガス冷媒は、異物捕捉手段１３で捕捉されなかった気体異物と共にアキュムレータ８を経て圧縮機１へ戻る。なお、暖房運転時の冷媒回路、すなわち、圧縮機１から利用側熱交換器

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６と流量調整器５と熱源機側熱交換器３とアキュムレータ８とを順次に経て再び圧縮機１に戻る冷媒回路を、本明細書では、第２の冷媒回路とする。

【００７４】油分離器９で、ガス冷媒と完全に分離されたＨＦＣ用冷凍機油はバイパス路９ａを経て、異物捕捉手段１３の下流で本流と合流して、圧縮機１へ戻るので、第１の接続配管Ｃや第２の接続配管Ｄに残留していた鉱油と混ざることはなく、ＨＦＣ用冷凍機油はＨＦＣに対して非相溶化することはなく、またＨＦＣ用冷凍機油は鉱油により劣化することはない。

【００７５】また、固形異物もＨＦＣ用冷凍機油と混合することはなく、ＨＦＣ用冷凍機油は劣化しない。また、気体異物は、ＨＦＣ冷媒が冷媒回路を１サイクル循環して、異物捕捉手段１３を１回通る間には一部が捕捉されるだけで、ＨＦＣ用冷凍機油と気体異物は混合されるが、ＨＦＣ用冷凍機油の劣化は化学反応で、急激には進まない。その一例を図２に示す。異物捕捉手段１３を１回通る間に捕捉されなかった、気体異物はＨＦＣ冷媒の循環と共に何回も異物捕捉手段１３を通るので、ＨＦＣ用冷凍機油の劣化するよりも速く、異物捕捉手段１３で捕捉すればよい。

【００７６】次に、異物捕捉手段１３の一例について説明する。図３は異物捕捉手段１３の一例を図示したものである。５１は円筒状の容器、５２は容器５１の上部に設けられた流出配管、５３は容器５１の上部内面に、円錐の扇状の側面形状に形成・設置されたフィルタ、５４は容器５１に予め充填されている鉱油、５５は容器５１の下部側面に設けられた流入配管、５５ａは流入配管５５の容器５１の内部にある部分の配管側面に多数設けられた流出穴である。

【００７７】フィルタ５３は、例えば細線を編みこんだメッシュ状のものであったり、焼結金属で形成され、各隙間は数ミクロンから数十ミクロンで、これ以上の固体異物が通過することはできない。また、容器５１の上部空間に微量存在する可能性のあるミスト状の液体異物も、フィルタ５３を通過しようとすると、ここで捕捉され重力により容器側面方向に流れて容器５１の下部に落下する。５６は塩素イオンを捕捉するイオン交換樹脂である。図１においては、流出配管５２はイオン交換樹脂５６を経てアキュムレータ８に、流入配管５５は四方弁２に接続されている。

【００７８】流入配管５５より流入したガス冷媒は、流出穴５５ａを経て、鉱油５４の中を泡状になって通過し、フィルタ５３、イオン交換樹脂５６を経て、流出配管５２より流出する。流入配管５５よりガス冷媒と共に流入した固体異物は、流出穴５５ａより鉱油５４の中へ流出後に、鉱油５４が抵抗になって速度が低下し、重力により、容器５１の底部に沈殿する。また、鉱油５４がなくても、容器５１の断面積は流入配管５５の断面積よりも大きく、容器５１の内部に入ると、冷媒（気体）の

流速は低下するので、個体異物は重力の作用により冷媒（気体）と分離され、容器５１の下部に沈殿する。また、鉱油５４の中でのガス流速が大きく、鉱油５４の上部まで、固体異物が万一吹き上げられても、フィルタ５３により捕捉される。

【００７９】流入配管５５よりガス冷媒と共に流入した液体異物は、流出穴５５ａより鉱油５４の中へ流出後に、鉱油５４が抵抗になって速度が低下し、気液分離されて、鉱油５４と共に滞留する。また、鉱油５４がなくても、容器５１の断面積は流入配管５５の断面積よりも大きく、容器５１の内部に入ると、冷媒（気体）の流速は低下するので、液体異物は重力の作用により冷媒（気体）と分離され、容器５１の下部に滞留する。鉱油５４の中でのガス流速が大きく、鉱油５４の液面が乱れて、鉱油がミスト状になり、ガス冷媒の流れにのったとしても、フィルタ５３により捕捉され、前述のようにここで捕捉され重力により容器５１の側面方向に流れて容器５１の下部に落下する。

【００８０】流入配管５５よりガス冷媒と共に流入した気体異物は、流出穴５５ａを経て、鉱油５４の中を泡状になって通過し、フィルタ５３、イオン交換樹脂５６を経て、流出配管５２より流出する。気体異物中の主成分はＣＦＣまたはＨＣＦＣだが、これらは鉱油５４に溶解する。一例を図４に示す。図４（ａ）は鉱油とＣＦＣとの溶解度曲線、図４（ｂ）は鉱油とＨＣＦＣとの溶解度曲線を示す図である。図において、横軸は温度（℃）、縦軸はＣＦＣ又はＨＣＦＣの圧力（ｋｇ／ｃｍ²）であり、ＣＦＣ又はＨＣＦＣの濃度（ｗｔ％）をパラメータとして溶解度曲線を示している。

【００８１】流入配管５５よりガス冷媒と共に流入した気体異物は、流出穴５５ａを経て、鉱油５４の中を泡状になることで、鉱油５４との接触が増え、ＣＦＣやＨＣＦＣはより確実に鉱油５４に溶解する。しかし、ＨＦＣは鉱油には溶解しないので、全てが流出配管５２から流出される。このようにして、容器５１の内部で固体異物と液体異物は完全に分離・捕捉される。また、気体異物の主成分であるＣＦＣやＨＣＦＣも何回か、この部分を通過する間に、大部分が溶解・捕捉される。

【００８２】また、残留異物中のＣＦＣやＨＣＦＣ以外の塩素成分は、冷媒回路中では微量の存在する水に溶けて塩素イオンとして存在するので、何回かイオン交換樹脂５６を通過することにより捕捉される。

【００８３】次に、油分離器９について説明する。高性能油分離器の例としては、実公平5-19721号公報に示されたものがある。図５にその内部構造図を示す。７１は上シェル７１ａ及び下シェル７１ｂにより構成される円形胴体部を有する密閉容器、７２は先端に網状体７３を有する入口管であり、入口管７２は上シェル７１ａの略中央部を貫通して容器７１に突出して取り付けられている。７８は網状体７３の上部に設けられた、多数の小孔を有するパンチングメタルなどにより構成される円形の均速板、７９は均速板７８の上部に形成される上部空間であり、冷媒流出空間となるものである。７４は冷媒流出空間７９に端部を持つ出口管、７７は排油管である。

【００８４】このような、高性能油分離器を直列に複数個接続することで、分離効率１００％の油分離器を得ることができる。図６に、図５の構造の油分離器におけるガス冷媒の流速と分離効率の実験結果を示す。図において、横軸は容器内平均流速（ｍ／ｓ）、縦軸は分離効率（％）を示す。直列油分離器の最初の油分離器の内径を最大の流速が０．１３ｍ／ｓ以下となるようにすることで、一般に圧縮機１から吐出される冷凍機油は冷媒流量比で１．５ｗｔ％以下のため、最初の油分離器の２次側では、冷凍機油は冷媒流量比で０．０５ｗｔ％以下になっている。

【００８５】この比率では、ガス冷媒と冷凍機油の気液二相流の流動様式は噴霧流となっているので、２番目の油分離器も同径以上とし、かつ流入配管のメッシュを焼結金属など目を非常に細かくすることで、完全に冷凍機油を分離することができる。このように、既存の油分離器の寸法や複数組み合せることで、分離効率１００％の油分離器を実現することは可能であり、図１に示す油分離器９はこのようなものである。

【００８６】以上のように、油分離器９と異物捕捉手段１３を熱源機Ａに内蔵することで、熱源機Ａと室内機Ｂのみを新規に交換し、第１の接続配管Ｃと第２の接続配管Ｄを交換しないで、老朽化したＣＦＣまたはＨＣＦＣを用いた空気調和装置を新しいＨＦＣを用いた空気調和装置に入れ替えることができる。このような方法によれば、既設配管再利用方法として、従来の洗浄方法１とは違って、洗浄装置を用いて専用の洗浄液（ＨＣＦＣ１４１ｂやＨＣＦＣ２２５）で洗浄するということをしないので、オゾン層破壊の可能性は全く無く、また可燃性・毒性も皆無で、洗浄液残留の懸念も無く、洗浄液を回収する必要も無い。

【００８７】また、従来の洗浄方法２と違って、洗浄運転を３回繰り返してＨＦＣ冷媒やＨＦＣ冷凍機油を３回入れ替える必要がないため、必要なＨＦＣや冷凍機油は１台分で済むためコスト・環境上有利である。また、交換用冷凍機油の管理も不要で、かつ冷凍機油過不足の危険性も全く発生しない。また、ＨＦＣ用冷凍機油の非相溶化や冷凍機油の劣化の恐れも無い。

【００８８】この実施の形態では、室内機Ｂが１台接続された例について説明したが、室内機Ｂが並列または直列に複数台接続された空気調和装置でも同様の効果を奏することは言うまでもない。また、熱源機側熱交換器３と直列または並列に氷蓄熱槽や水蓄熱槽（湯を含む）が設置されていても同様の効果を奏することは明らかである。また、熱源機Ａが複数台並列に接続された空気調和装置においても同様の効果を奏することは明らかであ

る。また、空気調和装置に限らず、蒸気圧縮式の冷凍サイクル応用品で、熱源機側熱交換器が内蔵されたユニットと利用側熱交換器が内蔵されたユニットが離れて設置されるものであれば、同様の効果を奏することは明らかである。

【００８９】実施の形態２．図７は、この発明の実施の形態２による冷凍サイクル装置の一例として、空気調和装置の冷媒回路を示す図である。図７において、符号Ｂ～Ｄ、１～９及び８ａ、９ａは、実施の形態１と同様のものであるから、詳細な説明を省略する。

【００９０】次に、１２ａは高温高圧のガス冷媒を冷却・液化する冷却手段（冷却装置）、１２ｂは低圧二相冷媒をガス化する加熱手段（加熱装置）、１３は上記加熱手段１２ｂの出口部に直列に設けられた異物捕捉手段（異物捕捉装置）である。１４ａは上記異物捕捉手段１３の出口部に設けられた第１の電磁弁、１４ｂは上記加熱手段１２ｂの入口部に設けられた第２の電磁弁である。

【００９１】１０は第１の切換弁であり、熱源機側熱交換器３の冷房運転時の出口端、四方弁２の暖房運転時の出口端、上記冷却手段１２ａの入口端、上記電磁弁１４ａの出口端の４箇所のうち、運転モードに応じて、以下のような接続切換を行うものである。すなわち、冷房洗浄運転時には熱源機側熱交換器３の冷房運転時の出口端と冷却手段１２ａの入口端とを接続し、かつ電磁弁１４ａの出口端と四方弁２の冷房運転時の入口端（暖房運転時の出口端）を接続する。また、暖房洗浄運転時には、四方弁２の暖房運転時の出口端と冷却手段１２ａの入口端とを接続し、かつ電磁弁１４ａの出口端と熱源機側熱交換器３の暖房運転時の入口端（冷房運転時の出口端）とを接続する。

【００９２】１１は第２の切換弁であり、冷房洗浄運転時及び冷房通常運転時には、冷却手段１２ａの出口端を第１の操作弁４に接続し、暖房洗浄運転時及び暖房通常運転時には、冷却手段１２ａの出口端を第２の操作弁７に接続し、かつ、冷房洗浄運転時には電磁弁１２ｂの入口端を第２の操作弁７に接続し、暖房洗浄運転時には電磁弁１２ｂの入口端を第１の操作弁４に接続するものである。１４ｃは第３の電磁弁であり、第１の切換弁１０の熱源機側熱交換器３への接続端と、第２の切換弁１１の第１の操作弁４への接続端との間を接続する配管途中に設けられた電磁弁である。１４ｄは第４の電磁弁であり、第１の切換弁１０の四方弁２への接続端と、第２の切換弁１１の第２の操作弁７への接続端との間を接続する配管途中に設けられた電磁弁である。

【００９３】上記第１の切換弁１０は、熱源機側熱交換器３の冷房運転時の出口端から冷却手段１２ａの入口端への冷媒の流通は許容するがその逆は許容しないように設けられた逆止弁１０ａ、四方弁２の暖房運転時の出口端から冷却手段１２ａの入口端への冷媒の流通は許容するがその逆は許容しないように設けられた逆止弁１０ｂ、第１の電磁弁１４ａの出口端から熱源機側熱交換器３の冷房運転時の出口端への冷媒の流通は許容するがその逆は許容しないように設けられた逆止弁１０ｃ、第１の電磁弁１４ａの出口端から四方弁２の暖房運転時の出口端への冷媒の流通は許容するがその逆は許容しないように設けられた逆止弁１０ｄより構成されているため、電気信号によらず各接続端の圧力により自己切換可能な切換弁である。

【００９４】上記冷却手段１２ａの冷却源は、空気・水のいずれでもよく、上記加熱手段１２ｂの加熱源も空気・水のいずれでも、あるいはヒーターでもよい。また、冷却手段１２ａと加熱手段１２ｂは、第１の切換弁１０と第２の切換弁１１に挟まれた、高温高圧側の配管と低温低圧側の配管を熱的に接触させて、たとえば、二重管の外側配管として高温高圧側の配管、内側配管として低温低圧側の配管で構成することでもよい。すなわち、加熱手段１２ｂと冷却手段１２ａとの間で熱移動させてもよい。

【００９５】以上のような構成により、熱源機Ａは、油分離器９、分離油のバイパス路９ａ、冷却手段１２ａ、加熱手段１２ｂ、異物捕捉手段１３、第１の切換弁１０、第２の切換弁１１、第１の電磁弁１４ａ、第２の電磁弁１４ｂ、第３の電磁弁１４ｃ、第４の電磁弁１４ｄを内蔵している。なお、加熱手段１２ｂおよび異物捕捉手段１３を含む冷媒回路部分を、本明細書では、第１のバイパス路とする。また、冷却手段１２ａを含む冷媒回路部分を、本明細書では、第２のバイパス路とする。なおまた、この空気調和装置は冷媒としてＨＦＣを使うものである。

【００９６】次に、ＣＦＣやＨＣＦＣを使った空気調和装置が老朽化した場合の、空気調和装置交換の手順を示す。ＣＦＣまたはＨＣＦＣを回収し、熱源機Ａと室内機Ｂを図７に示すものと交換する。第１の接続配管Ｃと第２の接続配管Ｄは、ＨＣＦＣを使った空気調和装置のものを再利用する。熱源機Ａには予めＨＦＣが充填されているので、第１の操作弁４と第２の操作弁７は閉じたまま、室内機Ｂ、第１の接続配管Ｃ、第２の接続配管Ｄを接続状態で真空引きをし、その後第１の操作弁４と第２の操作弁７の開弁とＨＦＣの追加充填を実施する。その後、まず洗浄運転を実施し、その後通常の空調運転を実施する。

【００９７】次に、洗浄運転の内容を図７に添って説明する。図中、実線矢印が冷房洗浄運転の流れを、破線矢印が暖房洗浄運転の流れを示す。まず冷房洗浄運転について説明する。圧縮機１で圧縮された高温高圧のガス冷媒は、ＨＦＣ用冷凍機油と共に圧縮機１を吐出され、油分離器９へ流入する。ここで、ＨＦＣ用の冷凍機油は完全に分離され、ガス冷媒のみが、四方弁２を経て、熱源機側熱交換器３へと流入し、ここで空気・水など熱源媒

体と熱交換器してある程度凝縮液化する。

【００９８】ある程度凝縮液化した冷媒は第１の切換弁１０を経て冷却手段１２ａに流入し、ここで完全に凝縮液化して、第２の切換弁１１、第１の操作弁４を経て第１の接続配管Ｃに流入する。ＨＦＣの液冷媒が第１の接続配管Ｃを流れるときに、第１の接続配管Ｃに残留しているＣＦＣ・ＨＣＦＣ・鉱油・鉱油劣化物（以下残留異物と称する）を少しずつ洗浄してＨＦＣの液冷媒と共に流れ、流量調整器５へ流入し、ここで低圧まで減圧されて低圧二相状態となり、利用側熱交換器６で空気などの利用側媒体と熱交換してある程度蒸発・ガス化する。

【００９９】ある程度蒸発・ガス化した気液二相状態の冷媒は第１の接続配管Ｃの残留異物と共に第２の接続配管Ｄに流入する。第２の接続配管Ｄに残留している残留異物は、ここを流れる冷媒が気液二相状態のため、流速も速く、かつ液冷媒と共に、残留異物は洗浄され、第１の接続配管Ｃより速い速度で洗浄される。

【０１００】その後、ある程度蒸発・ガス化した気液二相状態の冷媒は、第１の接続配管Ｃの残留異物と第２の接続配管Ｄの残留異物と共に、第２の操作弁７、第２の切換弁１１、第２の電磁弁１４ｂを経て、加熱手段１２ｂへ流入し、ここで完全に蒸発・ガス化され、異物捕捉手段１３へ流入する。残留異物は、沸点の違いにより相が異なり、固体異物・液体異物・気体異物の３種類に分類される。異物捕捉手段１３では、固体異物と液体異物は完全にガス冷媒と分離・捕捉される。

【０１０１】気体異物はその一部が捕捉され、一部は捕捉されない。その後ガス冷媒は、異物捕捉手段１３で捕捉されなかった気体異物と共に第１の電磁弁１４ａ、第１の切換弁１０、四方弁２、アキュムレータ８を経て圧縮機１へ戻る。油分離器９で、ガス冷媒と完全に分離されたＨＦＣ用冷凍機油はバイパス路９ａを経て、異物捕捉手段１３の下流で本流と合流して、圧縮機１へ戻るので、第１の接続配管Ｃや第２の接続配管Ｄに残留していた鉱油と混ざることはなく、ＨＦＣ用冷凍機油はＨＦＣに対して非相溶化することはなく、またＨＦＣ用冷凍機油は鉱油により劣化することはない。

【０１０２】また、固形異物もＨＦＣ用冷凍機油と混合することはなく、ＨＦＣ用冷凍機油は劣化しない。また、気体異物はＨＦＣ冷媒が冷媒回路を１サイクル循環して、異物捕捉手段１３を１回通る間には一部が捕捉されるだけで、ＨＦＣ用冷凍機油と気体異物は混合されるが、ＨＦＣ用冷凍機油の劣化は化学反応で、急激には進まない。その一例を図２に示す。異物捕捉手段１３を１回通る間に捕捉されなかった、気体異物はＨＦＣ冷媒の循環と共に何回も異物捕捉手段１３を通るので、ＨＦＣ用冷凍機油の劣化するよりも速く、異物捕捉手段１３で捕捉すればよい。

【０１０３】次に暖房洗浄運転の流れを説明する。圧縮機１で圧縮された高温高圧のガス冷媒はＨＦＣ用冷凍機

油と共に圧縮機１を吐出され、油分離器９へ流入する。ここで、ＨＦＣ用の冷凍機油は完全に分離され、ガス冷媒のみが四方弁２、第１の切換弁１０を経て冷却手段１２ａへ流入する。

【０１０４】ここで、ガス冷媒は冷却され、ある程度凝縮・液化する。ある程度凝縮・液化された気液二相状態の冷媒は第２の切換弁１１、第２の操作弁７を経て第２の接続配管Ｄへ流入する。第２の接続配管に残留している残留異物は、ここを流れる冷媒が気液二相状態のため、流速も速く、かつ液冷媒と共に、残留異物は洗浄され、冷房洗浄運転時の第１の接続配管Ｃより速い速度で洗浄される。

【０１０５】その後、ある程度凝縮・液化した冷媒は、第２の接続配管Ｄの残留異物と共に、利用側熱交換器６へと流入し、ここで空気など利用側媒体と熱交換器して完全に凝縮液化する。凝縮液化した冷媒は流量調整器５へ流入し、ここで低圧まで減圧されて低圧二相状態となり、第１の接続配管Ｃに流入する。気液二相状態のため、流速も速く、かつ液冷媒と共に、残留異物は洗浄され、冷房洗浄運転時の第１の接続配管Ｃより速い速度で洗浄される。第２の接続配管Ｄと第１の接続配管Ｃから洗浄された残留異物と共に、気液二相状態の冷媒は、第１の操作弁４、第２の切換弁１１、第２の電磁弁１４ｂを経て、加熱手段１２ｂで加熱され、蒸発・ガス化され、異物捕捉手段１３へ流入する。

【０１０６】残留異物は、沸点の違いにより相が異なり、固体異物・液体異物・気体異物の３種類に分類される。異物捕捉手段１３では、固体異物と液体異物は完全にガス冷媒と分離・捕捉される。気体異物はその一部が捕捉され、一部は捕捉されない。その後ガス冷媒は、異物捕捉手段１３で捕捉されなかった気体異物と共に、第１の切換弁１０、四方弁２を経て、熱源機側熱交換器３へ流入し、ここでは送風機などを停止して熱交換させずに通過させ、アキュムレータ８を経て圧縮機１へ戻る。

【０１０７】油分離器９で、ガス冷媒と完全に分離されたＨＦＣ用冷凍機油はバイパス路９ａを経て、異物捕捉手段１３の下流で本流と合流して、圧縮機１へ戻るので、第１の接続配管Ｃや第２の接続配管Ｄに残留したい た鉱油と混ざることはなく、ＨＦＣ用冷凍機油はＨＦＣに対して非相溶化することはなく、またＨＦＣ用冷凍機油は鉱油により劣化することはない。

【０１０８】また、固形異物もＨＦＣ用冷凍機油と混合することはなく、ＨＦＣ用冷凍機油は劣化しない。また、気体異物はＨＦＣ冷媒が冷媒回路を１サイクル循環して、異物捕捉手段１３を１回通る間には一部が捕捉されるだけで、ＨＦＣ用冷凍機油と気体異物は混合されるが、ＨＦＣ用冷凍機油の劣化は化学反応で、急激には進まない。その一例を図２に示す。異物捕捉手段１３を１回通る間に捕捉されなかった気体異物は、ＨＦＣ冷媒の循環と共に何回も異物捕捉手段１３を通るので、ＨＦＣ

用冷凍機油の劣化するよりも速く、異物捕捉手段１３で捕捉すればよい。異物捕捉手段１３、油分離器９は、実施の形態１に示すものと全く同一のため、ここでは説明を省略する。

【０１０９】次に、通常空調運転について、図８に添って説明する。図中、実線矢印が冷房通常運転の流れを、破線矢印が暖房通常運転の流れを示す。まず冷房通常運転について説明する。圧縮機１で圧縮された高温高圧のガス冷媒は、ＨＦＣ用冷凍機油と共に圧縮機１を吐出され、油分離器９へ流入する。ここで、ＨＦＣ用の冷凍機油は完全に分離され、ガス冷媒のみが、四方弁２を経て、熱源機側熱交換器３へと流入し、ここで空気・水など熱源媒体と熱交換して凝縮液化する。

【０１１０】凝縮液化した冷媒は、その大部分が第３の電磁弁１４ｃを経由し、一方、一部が第１の切換弁１０、冷却手段１２ａ、第２の切換弁１１を経由して、これらが合流後、第１の操作弁４に流入し、第１の接続配管Ｃを経て、流量調整器５へ流入し、ここで低圧まで減圧されて低圧二相状態となり、利用側熱交換器６で空気などの利用側媒体と熱交換して蒸発・ガス化する。蒸発・ガス化した冷媒は第２の接続配管Ｄ、第２の操作弁７、第４の電磁弁１４ｄ、四方弁２、アキュムレータ８を経て圧縮機１へ戻る。

【０１１１】油分離器９で、ガス冷媒と完全に分離されたＨＦＣ用冷凍機油は、バイパス路９ａを経て、四方弁２の下流で本流と合流して、圧縮機１へ戻る。第１の電磁弁１４ａ、第２の電磁弁１４ｂは閉じられているので、異物捕捉手段１３は閉鎖空間として隔離されており、洗浄運転中に捕捉した異物が、再び運転回路中に戻ることがない。また、実施の形態１と比べると、異物捕捉手段１３を経由しないため、圧縮機１の吸入圧力損失が小さく、能力の低下が小さい。

【０１１２】次に暖房通常運転の流れを説明する。圧縮機１で圧縮された高温高圧のガス冷媒は、ＨＦＣ用冷凍機油と共に圧縮機１を吐出され、油分離器９へ流入する。ここで、ＨＦＣ用の冷凍機油は完全に分離され、ガス冷媒のみが四方弁２を経て、大部分が第４の電磁弁１４ｄを経由して、一方、一部が第１の切換弁１０、冷却手段１２ａ、第２の切換弁１１を経由して、これらが合流後、第２の操作弁７に流入し、第２の接続配管Ｄを経て、利用側側熱交換器６へと流入し、ここで空気など利用側媒体と熱交換器して完全に凝縮液化する。

【０１１３】凝縮液化した冷媒は流量調整器５へ流入し、ここで低圧まで減圧されて低圧二相状態となり、第１の接続配管Ｃ、第１の操作弁４、第３の電磁弁１４ｃを経て、熱源機側熱交換器３へ流入し、ここで空気・水などの熱源媒体と熱交換して蒸発・ガス化する。蒸発・ガス化した冷媒は四方弁２、アキュムレータ８を経て圧縮機１へ戻る。

【０１１４】油分離器９で、ガス冷媒と完全に分離されたＨＦＣ用冷凍機油は、バイパス路９ａを経て、圧縮機１へ戻る。第１の電磁弁１４ａ、第２の電磁弁１４ｂは閉じられているので、異物捕捉手段１３は閉鎖空間として隔離されているので、洗浄運転中に捕捉した異物が、再び運転回路中に戻ることがない。また、実施の形態１と比べると、異物捕捉手段１３を経由しないため、圧縮機１の吸入圧力損失が小さく、能力の低下が小さい。

【０１１５】以上のように、油分離器９と異物捕捉手段１３を熱源機Ａに内蔵することで、熱源機Ａと室内機Ｂのみを新規に交換し、第１の接続配管Ｃと第２の接続配管Ｄを交換しないで、老朽化したＣＦＣまたはＨＣＦＣを用いた空気調和装置を新しいＨＦＣを用いた空気調和装置に入れ替えることができる。このような方法によれば、既設配管再利用方法として、従来の洗浄方法１とは違って、洗浄装置を用いて専用の洗浄液（ＨＣＦＣ１４１ｂやＨＣＦＣ２２５）で洗浄するということをしないので、オゾン層破壊の可能性は全く無く、また可燃性・毒性も皆無で、洗浄液残留の懸念も無く、洗浄液を回収する必要も無い。

【０１１６】また、従来の洗浄方法２と違って、洗浄運転を３回繰り返してＨＦＣ冷媒やＨＦＣ冷凍機油を３回入れ替える必要がないため、必要なＨＦＣや冷凍機油は１台分で済むためコスト・環境上有利である。また、交換用冷凍機油の管理も不要で、かつ冷凍機油過不足の危険性も全く発生しない。また、ＨＦＣ用冷凍機油の非相溶化や冷凍機油の劣化の恐れも無い。

【０１１７】第１の電磁弁１４ａ、第２の電磁弁１４ｂ、第３の電磁弁１４ｃ、第４の電磁弁１４ｄを設けたことで、洗浄運転時には異物捕捉手段１３を通過して上記に示す洗浄効果を得つつ、洗浄運転後の通常運転時には、第１の電磁弁１４ａ、第２の電磁弁１４ｂは閉じて、異物捕捉手段１３は閉鎖空間として隔離されているので、洗浄運転中に捕捉した異物が、再び運転回路中に戻ることがない。また、実施の形態１と比べると、異物捕捉手段１３を経由しないため、圧縮機１の吸入圧力損失が小さく、能力の低下が小さい。

【０１１８】また、冷却手段１２ａ、加熱手段１２ｂ、第１の切換弁１０、第２の切換弁１１を設けたので、冷房・暖房に関わらず、洗浄運転時に第１の接続配管Ｃ、第２の接続配管Ｄに液冷媒または気液二相冷媒が流れるので、残留異物を洗浄するのに、洗浄効果が高く、洗浄時間を短くすることができる。また、冷却手段１２ａ、加熱手段１２ｂにより熱交換量を制御できるので、外気温度や室内の負荷に関係なく、任意の条件時にほぼ同一の洗浄運転が可能で、効果・手間が一定化する。

【０１１９】この実施の形態では、室内機Ｂが１台接続された例について説明したが、室内機Ｂが並列または直列に複数台接続された空気調和装置でも同様の効果を奏することは言うまでもない。また、熱源機側熱交換器３と直列または並列に氷蓄熱槽や水蓄熱槽（お湯を含む）

が設置されていても同様の効果を奏することは明らかである。また、熱源機Ａが複数台並列に接続された空気調和装置においても同様の効果を奏することは明らかである。また、空気調和装置に限らず、蒸気圧縮式の冷凍サイクル応用品で、熱源機側熱交換器が内蔵されたユニットと利用側熱交換器が内蔵されたユニットが離れて設置されるものであれば、同様の効果を奏することは明らかである。

【０１２０】実施の形態３．図９は、この発明の実施の形態３による冷凍サイクル装置の一例として、空気調和装置の冷媒回路を示す図である。図９において、符号Ｂ～Ｄ、１～８及び８ａは、実施の形態１及び２で説明したものと同様のものであるから、詳細な説明を省略する。また、符号１０、１１、１２ａ、１２ｂ、１３は、実施の形態２で説明したものと同様のものであるから、詳細な説明を省略する。

【０１２１】次に、図９において、９は油分離器で、実施の形態１、２と同様のものであるが、第１の切換弁１０と冷却手段１２ａの間に設けられている点が異なる。また、９ａは油分離器９の底部に端を発して異物捕捉手段１３の下流側に戻るバイパス路で、実施の形態１、２と同様のものだが、戻し位置が異物捕捉手段１３と第１の切換弁１０との間である点が異なる。また、１５は第２の切換弁１１と加熱手段１２ｂとの間に設けられた第１流量制御手段、１６は冷却手段１２ａと第２の切換弁１１との間に設けられた第２の流量制御手段である。

【０１２２】ＣＣは第１の接続配管Ｃと第１の操作弁４の間に設けられた第３の接続配管、ＤＤは第２の接続配管Ｄと第２の操作弁７の間に設けられた第４の接続配管である。１７ａは第３の接続配管ＣＣに設けられた第３の操作弁、１７ｂは第４の接続配管ＤＤに設けられた第４の操作弁、１７ｃは第３の接続配管ＣＣの第１の操作弁４と第３の操作弁１７ａとの間の配管と第１の切換弁１０との間に設けられた第５の操作弁、１７ｄは第３の接続配管ＣＣの第３の操作弁１７ａより第１の接続配管Ｃ側の部分と第２の切換弁１１との間に設けられた第６の操作弁、１７ｅは第４の接続配管ＤＤの第２の操作弁７と第４の操作弁１７ｂとの間の配管とと第１の切換弁１０との間に設けられた第７の操作弁、１７ｆは第４の接続配管ＤＤの第４の操作弁１７ｂより第２の接続配管Ｄ側の部分と第２の切換弁１１との間に設けられた第８の操作弁である。

【０１２３】Ｅは以上のように構成された洗浄機であり、油分離器９、バイパス路９ａ、冷却手段１２ａ、加熱手段１２ｂ、異物捕捉手段１３、第１の切換弁１０、第２の切換弁１１、第１の流量制御手段１５、第２の流量制御手段１６を内蔵したものである。この洗浄機Ｅは、第５～第８の操作弁１７ｃ～１７ｆの部分から、全体の空気調和装置から脱着可能に接続されている。なお、本明細書では、加熱手段１２ｂおよび異物捕捉手段１３を含む冷媒回路部分を、実施の形態２で記載したように、第１のバイパス路とする。また、油分離器９の有無に係わらず、冷却手段１２ａを含む冷媒回路部分を、第２のバイパス路とする。さらに、冷却手段１２ａを含まず、油分離器９だけが存在する場合を想定して、これを第３のバイパス路とする。

【０１２４】また、１８ａは第１の接続配管Ｃと流量調整器５との間に設けられた第５の電磁弁、１８ｂは第２の接続配管Ｄと利用側熱交換器６との間に設けられた第６の電磁弁、１８ｃは第５の電磁弁１８ａの第１の接続配管Ｃ側接続端と第６の電磁弁１８ｂの第２の接続配管Ｄ側接続端とを接続するバイパス路１８ｄの配管途中に設けられた第７の電磁弁である。Ｆは、第５～７の電磁弁１８ａ～１８ｃを内蔵した室内バイパス機である。なお、この空気調和装置は冷媒としてＨＦＣを使うものである。

【０１２５】次に、ＣＦＣやＨＣＦＣを使った空気調和装置が老朽化した場合の、空気調和装置交換の手順を示す。ＣＦＣまたはＨＣＦＣを回収し、熱源機Ａと室内機Ｂを図９に示すものと交換する。第１の接続配管Ｃと第２の接続配管ＤはＨＣＦＣを使った空気調和装置のものを再利用する。第３の接続配管ＣＣと第４の接続配管ＤＤは新規に敷設する。洗浄機Ｅを、第５、第６の操作弁１７ｃ、１７ｄを介して第３の接続配管ＣＣに、かつ、第７、第８の操作弁１７ｅ、１７ｆを介して第４の接続配管ＤＤに接続する。第１の接続配管Ｃ、第２の接続配管Ｄを室内バイパス機Ｆを介して室内機Ｂに接続する。

【０１２６】熱源機Ａには予めＨＦＣが充填されているので、第１の操作弁４と第２の操作弁７は閉じたまま、室内機Ｂ、第１の接続配管Ｃ、第２の接続配管Ｄ、第３の接続配管ＣＣ、第４の接続配管ＤＤ、洗浄機Ｅ、室内バイパス機Ｆを接続状態で真空引きをし、その後第１の操作弁４と第２の操作弁７の開弁とＨＦＣの追加充填を実施する。

【０１２７】その後、まず、第３，第４の操作弁１７ａ，１７ｂを閉弁し、第４～第８の操作弁１７ｃ～１７ｆを開弁し、第５，６の電磁弁１８ａ，１８ｂを閉弁し、第７の電磁弁１８ｃを開弁することで洗浄運転を実施する。その後、第３，第４の操作弁１７ａ，１７ｂを開弁し、第４～第８の操作弁１７ｃ～１７ｆを閉弁し、第５，６の電磁弁１８ａ，１８ｂを開弁し、第７の電磁弁１８ｃを閉弁することで通常の空調運転を実施する。

【０１２８】次に、洗浄運転の内容を図９に添って説明する。図中、実線矢印が冷房洗浄運転の流れを、破線矢印が暖房洗浄運転の流れを示す。まず冷房洗浄運転について説明する。圧縮機１で圧縮された高温高圧のガス冷媒はＨＦＣ用冷凍機油と共に圧縮機１を吐出され、四方弁２を経て、熱源機側熱交換器３へと流入し、ここで空気・水など熱源媒体と熱交換せずに通過し、第１の操作弁４、第５の操作弁１７ｃ、第１の切換弁１０を経て油

分離器９へ流入する。

【０１２９】ここで、ＨＦＣ用の冷凍機油は完全に分離され、ガス冷媒のみが、冷却手段１２ａに流入し、ここで凝縮液化して、第２の流量制御手段１６で少し減圧されて気液二相状態となる。この気液二相状態の冷媒は第２の切換弁１１、第６の操作弁１７ｄを経て第１の接続配管Ｃに流入する。

【０１３０】ＨＦＣの気液二相冷媒が第１の接続配管Ｃを流れるときに、第１の接続配管Ｃに残留しているＣＦＣ・ＨＣＦＣ・鉱油・鉱油劣化物（以下残留異物と称する）を気液二相状態のため比較的速く洗浄してＨＦＣの気液二相冷媒と共に流れ、第７の電磁弁１８ｃを経て、接続配管Ｃの残留異物と共に第２の接続配管Ｄに流入する。

【０１３１】第２の接続配管Ｄに残留している残留異物は、ここを流れる冷媒が気液二相状態のため、流速も速く、かつ液冷媒と共に、残留異物は洗浄され、比較的速い速度で洗浄される。その後、気液二相状態の冷媒は、第１の接続配管Ｃの残留異物と第２の接続配管Ｄの残留異物と共に、第８の操作弁１７ｆ、第２の切換弁１１を経て、第１の流量制御手段１５で低圧まで減圧されて、加熱手段１２ｂへ流入し、ここで蒸発・ガス化され、異物捕捉手段１３へ流入する。

【０１３２】残留異物は、沸点の違いにより相が異なり、固体異物・液体異物・気体異物の３種類に分類される。異物捕捉手段１３では、固体異物と液体異物は完全にガス冷媒と分離・捕捉される。気体異物はその一部が捕捉され、一部は捕捉されない。

【０１３３】その後ガス冷媒は、異物捕捉手段１３で捕捉されなかった気体異物と共に第１の切換弁１０、第７の操作弁１７ｅ、第２の操作弁７、四方弁２、アキュムレータ８を経て圧縮機１へ戻る。油分離器９で、ガス冷媒と完全に分離されたＨＦＣ用冷凍機油は、バイパス路９ａを経て、異物捕捉手段１３の下流側で本流と合流して、圧縮機１へ戻るので、第１の接続配管Ｃや第２の接続配管Ｄに残留したい鉱油と混ざることはなく、ＨＦＣ用冷凍機油はＨＦＣに対して非相溶化することはなく、またＨＦＣ用冷凍機油は鉱油により劣化することはない。

【０１３４】また、固形異物もＨＦＣ用冷凍機油と混合することはなく、ＨＦＣ用冷凍機油は劣化しない。また、気体異物はＨＦＣ冷媒が冷媒回路を１サイクル循環して、異物捕捉手段１３を１回通る間には一部が捕捉されるだけで、ＨＦＣ用冷凍機油と気体異物は混合されるが、ＨＦＣ用冷凍機油の劣化は化学反応で、急激には進まない。その一例を図２に示す。異物捕捉手段１３を１回通る間に捕捉されなかった、気体異物はＨＦＣ冷媒の循環と共に何回も異物捕捉手段１３を通るので、ＨＦＣ用冷凍機油の劣化するよりも速く、異物捕捉手段１３で捕捉すればよい。

【０１３５】次に暖房洗浄運転の流れを説明する。圧縮機１で圧縮された高温高圧のガス冷媒はＨＦＣ用冷凍機油と共に圧縮機１を吐出され、四方弁２、第２の操作弁７、第７の操作弁１７ｅ、第１の切換弁１０を経て油分離器９へ流入する。ここで、ＨＦＣ用の冷凍機油は完全に分離され、ガス冷媒のみが冷却手段１２ａへ流入する。ここで、ガス冷媒は冷却され、凝縮・液化する。

【０１３６】凝縮・液化された液冷媒は、第２の流量制御手段１６で少し減圧され、気液二相状態となり、第２の切換弁１１、第８の操作弁１７ｆを経て第２の接続配管Ｄへ流入する。第２の接続配管に残留している残留異物は、ここを流れる冷媒が気液二相状態のため、流速も速く、かつ液冷媒と共に、残留異物は洗浄され、比較的速い速度で洗浄される。

【０１３７】その後、その気液二相冷媒は、第２の接続配管Ｄの残留異物と共に、第７の電磁弁１８ｃを経て、第１の接続配管Ｃに流入する。ここでは、気液二相状態のため、流速も速く、かつ液冷媒と共に、残留異物は洗浄され、比較的速い速度で洗浄される。

【０１３８】第２の接続配管Ｄと第１の接続配管Ｃから洗浄された残留異物と共に、気液二相状態の冷媒は、第６の操作弁１７ｄ、第２の切換弁１１を経て、第１の流量制御手段１５で低圧まで減圧されて、加熱手段１２ｂへ流入し、ここで蒸発・ガス化され、異物捕捉手段１３へ流入する。残留異物は、沸点の違いにより相が異なり、固体異物・液体異物・気体異物の３種類に分類される。

【０１３９】異物捕捉手段１３では、固体異物と液体異物は完全にガス冷媒と分離・捕捉される。気体異物はその一部が捕捉され、一部は捕捉されない。その後ガス冷媒は、異物捕捉手段１３で捕捉されなかった気体異物と共に、第１の切換弁１０、第５の操作弁１７ｃを経て、熱源機側熱交換器３へ流入し、ここでは送風機などを停止して熱交換させずに通過させ、アキュムレータ８を経て圧縮機１へ戻る。

【０１４０】油分離器９で、ガス冷媒と完全に分離されたＨＦＣ用冷凍機油は、バイパス路９ａを経て、異物捕捉手段１３の下流側で本流と合流して、圧縮機１へ戻るので、第１の接続配管Ｃや第２の接続配管Ｄに残留していた鉱油と混ざることはなく、ＨＦＣ用冷凍機油はＨＦＣに対して非相溶化することはなく、またＨＦＣ用冷凍機油は鉱油により劣化することはない。

【０１４１】また、固形異物もＨＦＣ用冷凍機油と混合することはなく、ＨＦＣ用冷凍機油は劣化しない。また、気体異物はＨＦＣ冷媒が冷媒回路を１サイクル循環して、異物捕捉手段１３を１回通る間には一部が捕捉されるだけで、ＨＦＣ用冷凍機油と気体異物は混合されるが、ＨＦＣ用冷凍機油の劣化は化学反応で、急激には進まない。その一例を図２に示す。異物捕捉手段１３を１回通る間に捕捉されなかった気体異物は、ＨＦＣ冷媒の

循環と共に何回も異物捕捉手段１３を通るので、ＨＦＣ用冷凍機油の劣化するよりも速く、異物捕捉手段１３で捕捉すればよい。異物捕捉手段１３、油分離器９は、実施の形態１に示すものと全く同一のため、ここでは説明を省略する。

【０１４２】次に、通常空調運転について、図１０に添って説明する。図中、実線矢印が冷房通常運転の流れを、破線矢印が暖房通常運転の流れを示す。まず冷房通常運転について説明する。圧縮機１で圧縮された高温高圧のガス冷媒は圧縮機１を吐出され、四方弁２を経て、熱源機側熱交換器３へと流入し、ここで空気・水など熱源媒体と熱交換器して凝縮液化する。凝縮液化した冷媒は、第１の操作弁４、第３の操作弁１７ａ、第１の接続配管Ｃ、第５の電磁弁１８ａを経て、流量調整器５へ流入し、ここで低圧まで減圧されて低圧二相状態となり、利用側熱交換器６で空気などの利用側媒体と熱交換して蒸発・ガス化する。

【０１４３】蒸発・ガス化した冷媒は、第６の電磁弁１８ｂ、第２の接続配管Ｄ、第４の操作弁１７ｂ、第２の操作弁７、四方弁２、アキュムレータ８を経て圧縮機１へ戻る。第５～８の操作弁１７ｃ～１７ｆは閉じられているので、異物捕捉手段１３は閉鎖空間として隔離されているので、洗浄運転中に捕捉した異物が、再び運転回路中に戻ることがない。また、実施の形態１と比べると、異物捕捉手段１３を経由しないため、圧縮機１の吸入圧力損失が小さく、能力の低下が小さい。

【０１４４】次に暖房通常運転の流れを説明する。圧縮機１で圧縮された高温高圧のガス冷媒は、圧縮機１を吐出され、四方弁２を経て、第２の操作弁７に流入し、第４の操作弁１７ｂ、第２の接続配管Ｄ、第６の電磁弁１８ｂを経て、利用側側熱交換器６へと流入し、ここで空気など利用側媒体と熱交換器して凝縮液化する。

【０１４５】凝縮液化した冷媒は、流量調整器５へ流入し、ここで低圧まで減圧されて低圧二相状態となり、第５の電磁弁１８ａ、第１の接続配管Ｃ、第３の操作弁１７ａ、第１の操作弁４、熱源機側熱交換器３へ流入し、ここで空気・水などの熱源媒体と熱交換して蒸発・ガス化する。蒸発・ガス化した冷媒は、四方弁２、アキュムレータ８を経て圧縮機１へ戻る。

【０１４６】第５～８の操作弁１７ｃ～１７ｆは閉じられているので、異物捕捉手段１３は閉鎖空間として隔離されているので、洗浄運転中に捕捉した異物が、再び運転回路中に戻ることがない。また、実施の形態１と比べると、異物捕捉手段１３を経由しないため、圧縮機１の吸入圧力損失が小さく、能力の低下が小さい。また、実施の形態２と違って、冷却手段１２ａへは冷媒が流れないので、暖房能力のロスもない。

【０１４７】以上のように、油分離器９と異物捕捉手段１３を洗浄機Ｅに内蔵することで、熱源機Ａと室内機Ｂのみを新規に交換し、第１の接続配管Ｃと第２の接続配管Ｄを交換しないで、老朽化したＣＦＣまたはＨＣＦＣを用いた空気調和装置を新しいＨＦＣを用いた空気調和装置に入れ替えることができる。このような方法により、既設配管再利用方法として、従来の洗浄方法１とは違って、洗浄装置を用いて専用の洗浄液（ＨＣＦＣ１４１ｂやＨＣＦＣ２２５）で洗浄するということをしないので、オゾン層破壊の可能性は全く無く、また可燃性・毒性も皆無で、洗浄液残留の懸念も無く、洗浄液を回収する必要も無い。

【０１４８】また、従来の洗浄方法２と違って、洗浄運転を３回繰り返してＨＦＣ冷媒やＨＦＣ冷凍機油を３回入れ替える必要がないため、必要なＨＦＣや冷凍機油は１台分で済むためコスト・環境上有利である。また、交換用冷凍機油の管理も不要で、かつ冷凍機油過不足の危険性も全く発生しない。また、ＨＦＣ用冷凍機油の非相溶化や冷凍機油の劣化の恐れも無い。

【０１４９】また、第５～８の操作弁１７ｃ～１７ｆを設けたことで、洗浄運転時には異物捕捉手段１３を通過して上記に示す洗浄効果を得つつ、洗浄運転後の通常運転時には、第５～８の操作弁１７ｃ～１７ｆは閉じて、異物捕捉手段１３は閉鎖空間として隔離されているので、洗浄運転中に捕捉した異物が、再び運転回路中に戻ることがない。また、実施の形態１と比べると、異物捕捉手段１３を経由しないため、圧縮機１の吸入圧力損失が小さく、能力の低下が小さい。

【０１５０】また、冷却却手段１２ａ、加熱手段１２ｂ、第１の切換弁１０、第２の切換弁１１を設けたので、冷房・暖房に関わらず、洗浄運転時に第１の接続配管Ｃ、第２の接続配管Ｄに液冷媒または気液二相冷媒が流れるので、残留異物を洗浄するのに、洗浄効果が高く、洗浄時間を短くすることができる。また、冷却手段１２ａ、加熱手段１２ｂにより熱交換量を制御できるので、外気温度や室内の負荷に関係なく、任意の条件時にほぼ同一の洗浄運転が可能で、効果・手間が一定化する。

【０１５１】また、第１の流量制御手段１５と第２の流量制御手段１６を設けたので、第１、第２の接続配管Ｃ，Ｄを流れる冷媒を必ず気液二相状態とすることができるので、さらに残留異物を洗浄するのに、洗浄効果が高く、洗浄時間を短くすることができる。また、第１、第２の接続配管Ｃ，Ｄを流れる気液二相冷媒の圧力と乾き度も制御できるので、さらに任意の条件時にほぼ同一の洗浄運転が可能で、効果・手間が一定化する。

【０１５２】また、室内バイパス機Ｆを設けたので、第１、第２の接続配管Ｃ，Ｄを流れる冷媒の状態をほぼ同じにできるので、均一な洗浄運転が可能で、効果・手間が一定化する。また、残留異物が新しい室内機Ｂに流入することがないので、室内機Ｂの汚染を防ぐことができる。

【０１５３】また、油分離器９、バイパス路９ａ、冷却

手段１２ａ、加熱手段１２ｂ、異物捕捉手段１３、第１の切換弁１０、上記第２の切換弁１１、第１の流量制御手段１５、第２の流量制御手段１６を洗浄機Ｅに内蔵したので、熱源機Ａを小型化・低コスト化できる。また、熱源機Ａは、第１，第２の接続配管Ｃ，Ｄを新規に敷設する場合にも共通の熱源機とすることができる。

【０１５４】また、洗浄機Ｅが第５～第８の操作弁１７ｃ～１７ｆの部分で全体の空気調和装置から脱着可能に接続されているので、洗浄運転後にこれら操作弁を閉じてから洗浄機Ｅの内部の冷媒を回収し、空気調和装置から取り外し、別の同様の空気調和装置に取り付けて、洗浄運転を実施することができる。

【０１５５】この実施の形態では、室内機Ｂが１台接続された例について説明したが、室内機Ｂが並列または直列に複数台接続された空気調和装置でも同様の効果を奏することは言うまでもない。また、熱源機側熱交換器３と直列または並列に氷蓄熱槽や水蓄熱槽（湯を含む）が設置されていても同様の効果を奏することは明らかである。

【０１５６】また、熱源機Ａが複数台並列に接続された空気調和装置においても同様の効果を奏することは明らかである。また、空気調和装置に限らず、蒸気圧縮式の冷凍サイクル応用品で、熱源機側熱交換器が内蔵されたユニットと利用側熱交換器が内蔵されたユニットが離れて設置されるものであれば、同様の効果を奏することは明らかである。また、この実施の形態では、洗浄機Ｅはひとつの空気調和装置に１個だけ設置されているが、複数個設置されても同様の効果を呈することは明白である。

【０１５７】実施の形態４．この発明の実施の形態４においては、実施の形態３の図９において、洗浄機Ｅの油分離器９と第２の切換弁１１の間に、鉱油を注入する注入口を設けるか、鉱油のタンクを設ける。洗浄運転時に、この鉱油を第１、第２の接続配管Ｃ，Ｄに供給し、冷凍機油がスラッジ化した残留異物をこの鉱油に溶解させることで、洗浄し、異物捕捉手段１３で、実施の形態３と同様に捕捉させる。

【０１５８】実施の形態５．この発明の実施の形態５においては、実施の形態３の図９において、洗浄機Ｅの油分離器９と第２の切換弁１１の間に、水を注入する注入口を設けるか、水のタンクを設ける。洗浄運転時に、この水を第１、第２の接続配管Ｃ，Ｄに供給し、塩化鉄をイオン化させることで、洗浄し、異物捕捉手段１３で、実施の形態３と同様に捕捉させる。このときの水分のうち、低圧冷媒に過飽和分は液体水分となるが、この水分は鉱油より密度が大きいので、異物捕捉手段１３の底部に滞留する。低圧冷媒に飽和した水分は、熱源機Ａまたは第１、第２、第３、第４の接続配管Ｃ，Ｄ，ＣＣ，ＤＤのいずれかにドライヤ（水分吸着手段）を設けることで、ドライヤに吸着させ、冷媒回路内の水分を低減させることができる。

【０１５９】なお、実施の形態２においても、実施の形態３で説明したように、室内バイパス機Ｆを装着することができる。また、実施の形態５においても、実施の形態３に類似して、加熱手段１２ｂおよび異物捕捉手段１３を含む冷媒回路部分（第１のバイパス路）と、冷却手段１２ａを含む冷媒回路部分（第２のバイパス路）とを、冷媒回路本管から閉鎖あるいは分離することができる。その他、逐一に例示しないが、この発明は、そのような組み合わせあるいは変形をも含むものである。

【０１６０】

【発明の効果】この発明は以上のように構成されているので、以下のような効果を奏する。請求項１に記載の発明によれば、冷房回路において、利用側熱交換器から圧縮機への冷媒回路に、冷媒中の異物を捕捉する異物捕捉手段を備えたので、既設の接続配管から洗浄した冷媒中の固体異物と液体異物を十分に分離して捕捉することができる。気体異物は、冷媒が異物捕捉手段を何回か通るうちに捕捉することができる。請求項２に記載の発明によれば、冷房回路において、利用側熱交換器からアキュムレータへの冷媒回路に、冷媒中の異物を捕捉する異物捕捉手段を備えたので、既設の接続配管から洗浄した冷媒中の固体異物と液体異物を十分に分離して捕捉することができる。気体異物は、冷媒が異物捕捉手段を何回か通るうちに捕捉することができる。

【０１６１】また、請求項３に記載の発明によれば、冷房回路において、利用側熱交換器からアキュムレータへの冷媒回路をバイパスする第１バイパス路を設け、冷媒中の異物を捕捉する異物捕捉手段を備えたので、既設の接続配管から洗浄した冷媒中の固体異物と液体異物を十分に分離して捕捉することができる。気体異物は、冷媒が異物捕捉手段を何回か通るうちに捕捉することができる。

【０１６２】また、請求項４に記載の発明によれば、請求項３に記載の発明において、熱源機側熱交換器から流量調整器への冷媒回路をバイパスする第２バイパス路を設けて冷媒の冷却手段を備え、さらに、第１バイパス路の異物捕捉手段の上流側に冷媒の加熱手段を備えた。これにより、既設の接続配管から洗浄した冷媒中の異物を十分に分離して捕捉することができるうえに、さらに冷媒の加熱手段と冷却手段とを設けたので、洗浄運転時に室内機への接続配管に液冷媒または気液二相冷媒が流れるので、残留異物を洗浄するのに、洗浄効果が高く、洗浄時間を短くすることができる。また、加熱手段及び冷却手段により熱交換量を制御できるので、外気温度や室内の負荷に関係なく、任意の条件時にほぼ同一の洗浄運転が可能で、効果・手間が一定化する。

【０１６３】また、請求項５に記載の発明によれば、請求項４に記載の発明において、第１バイパス路の加熱手段の上流側に第１流量制御手段を備え、さらに、第２バ

イバス路の冷却手段の下流側に第２流量制御手段を備えた。すなわち、熱源機から室内機への接続配管に流入し、もしくは、室内機への接続配管から流出する冷媒の流量を制御する流量制御手段を設けた。これにより、室内機への接続配管を流れる冷媒を必ず気液二相状態とすることができるので、さらに残留異物を洗浄するのに洗浄効果が高く、洗浄時間を短くすることができる。また、接続配管を流れる気液二相冷媒の圧力と乾き度も制御できるので、さらに任意の条件時にほぼ同一の洗浄運転が可能で、効果・手間が一定化する。

【０１６４】

【０１６５】

【０１６６】また、請求項６に記載の発明によれば、請求項１～５に記載の発明において、圧縮機から熱源機側熱交換器への冷媒回路に、冷媒の油成分を分離する油分離手段を備えた。これにより、冷媒回路に異物捕捉手段を設け、冷媒から異物を十分に分離して捕捉するとともに、油分離器を設けて、新規冷媒用の冷凍機油を冷媒から十分に分離し、新規の冷凍機油が室内機側に流入するのを防止することができる。したがって、洗浄した冷媒中の異物と新規の冷凍機油（例えば、ＨＦＣ用冷凍機油）とが、混合することはなく、新規の冷凍機油が劣化しない。

【０１６７】また、請求項７に記載の発明によれば、請求項３の発明において、熱源機側熱交換器から流量調整器への冷媒回路をバイパスする第３バイパス路を設け、冷媒の油成分を分離する油分離手段を備えた。これにより、洗浄機の冷媒回路に異物捕捉手段を設け、冷媒から異物を十分に分離して捕捉するとともに、油分離器を設けて、新規冷媒用の冷凍機油を冷媒から十分に分離し、新規の冷凍機油が室内機側に流入するのを防止できることができる。したがって、洗浄した冷媒中の異物と新規の冷凍機油（例えば、ＨＦＣ用冷凍機油）とが、混合することはなく、新規の冷凍機油が劣化しない。

【０１６８】また、請求項８に記載の発明によれば、請求項４の発明において、第２バイパス路の冷却手段の上流側に冷媒の油成分を分離する油分離手段を備えた。これにより、冷媒の加熱手段と冷却手段とにより、接続配管中の異物の洗浄効果をさらにあげるとともに異物の捕捉効果を上げ、かつ、油分離器により、新規の冷凍機油が室内機側に流入するのを防止できる。また、洗浄した冷媒中の異物と新規の冷凍機油（例えば、ＨＦＣ用冷凍機油）とが、混合することはなく、新規の冷凍機油が劣化しない。

【０１６９】請求項９に記載の発明によれば、冷房回路における利用側熱交換器から圧縮機への冷媒回路で、かつ、暖房回路における熱源機側熱交換器から圧縮機への冷媒回路に、冷媒中の異物を捕捉する異物捕捉手段を備えた。これにより、既設の接続配管から洗浄した冷媒中の固体異物と液体異物を十分に分離して捕捉することができる。気体異物は、冷媒が異物捕捉手段を何回か通るうちに捕捉することができる。

請求項１０に記載の発明によれば、冷房回路における利用側熱交換器からアキュムレータへの冷媒回路で、かつ、暖房回路における熱源機側熱交換器からアキュムレータへの冷媒回路に、冷媒中の異物を捕捉する異物捕捉手段を備えた。これにより、既設の接続配管から洗浄した冷媒中の固体異物と液体異物を十分に分離して捕捉することができる。気体異物は、冷媒が異物捕捉手段を何回か通るうちに捕捉することができる。

【０１７０】請求項１１に記載の発明によれば、冷房回路における利用側熱交換器からアキュムレータへの冷媒回路をバイパスし、かつ、暖房回路における流量制御器から熱源機側熱交換器への冷媒回路をバイパスする第１バイパス路を設け、冷媒中の異物を捕捉する異物捕捉手段を備えた。これにより、既設の接続配管から洗浄した冷媒中の固体異物と液体異物を十分に分離して捕捉することができる。気体異物は、冷媒が異物捕捉手段を何回か通るうちに捕捉することができる。

【０１７１】請求項１２に記載の発明によれば、請求項１１に記載の発明において、冷房回路で熱源機側熱交換器から流量制御器への冷媒回路をバイパスし、かつ、暖房回路で圧縮機から利用側熱交換器への冷媒回路をバイパスする第２バイパス路を設けて冷媒の冷却手段を備え、さらに、第１バイパス路の異物捕捉手段の上流側に冷媒の加熱手段を備えた。これにより、既設の接続配管から洗浄した冷媒中の異物を十分に分離して捕捉することができるうえに、さらに冷媒の加熱手段と冷却手段とを設けたので、冷房・暖房に関わらず、洗浄運転時に室内機への接続配管に液冷媒または気液二相冷媒が流れるので、残留異物を洗浄するのに、洗浄効果が高く、洗浄時間を短くすることができる。また、加熱手段及び冷却手段により熱交換量を制御できるので、外気温度や室内の負荷に関係なく、任意の条件時にほぼ同一の洗浄運転が可能で、効果・手間が一定化する。

【０１７２】請求項１３に記載の発明によれば、請求項１２の発明において、第１バイパス路の加熱手段の上流側に第１流量制御手段を備え、さらに、第２バイパス路の冷却手段の下流側に第２流量制御手段を備えた。すなわち、熱源機から室内機への接続配管に流入し、もしくは、室内機への接続配管から流出する冷媒の流量を制御する流量制御手段を設けた。これにより、室内機への接続配管を流れる冷媒を必ず気液二相状態とすることができるので、さらに残留異物を洗浄するのに洗浄効果が高く、洗浄時間を短くすることができる。また、接続配管を流れる気液二相冷媒の圧力と乾き度も制御できるので、さらに任意の条件時にほぼ同一の洗浄運転が可能で、効果・手間が一定化する。

【０１７３】

【０１７４】

【０１７５】請求項１４に記載の発明によれば、請求項９～１３の発明において、冷房回路における圧縮機から熱源機側熱交換器への冷媒回路で、かつ、暖房回路における圧縮機から利用側熱交換器への冷媒回路に、冷媒の油成分を分離する油分離手段を備えた。これにより、冷媒回路に異物捕捉手段を設け、冷媒から異物を十分に分離して捕捉するとともに、油分離器を設けて、新規冷媒用の冷凍機油を冷媒から十分に分離し、新規の冷凍機油が室内機側に流入するのを防止することができる。したがって、洗浄した冷媒中の異物と新規の冷凍機油（例えば、ＨＦＣ用冷凍機油）とが、混合することはなく、新規の冷凍機油が劣化しない。

【０１７６】請求項１５に記載の発明によれば、請求項１２の発明において、冷房回路における圧縮機から熱源機側熱交換器への冷媒回路で、かつ、暖房回路における圧縮機から冷却手段への冷媒回路に、冷媒の油成分を分離する油分離手段を備えた。これにより、冷媒の加熱手段と冷却手段とにより、接続配管中の異物の洗浄効果をさらにあげるとともに異物の捕捉効果を上げ、かつ、油分離器により、新規の冷凍機油が室内機側に流入するのを防止できる。また、洗浄した冷媒中の異物と新規の冷凍機油（例えば、ＨＦＣ用冷凍機油）とが、混合することはなく、新規の冷凍機油が劣化しない。

【０１７７】請求項１６に記載の発明によれば、請求項１１の発明において、冷房回路で熱源機側熱交換器から流量制御器への冷媒回路をバイパスし、かつ、暖房回路で圧縮機から利用側熱交換器への冷媒回路をバイパスする第３バイパス路を設け、冷媒の油成分を分離する油分離手段を備えた。これにより、洗浄機の冷媒回路に異物捕捉手段を設け、冷媒から異物を十分に分離して捕捉するとともに、油分離器を設けて、新規冷媒用の冷凍機油を冷媒から十分に分離し、新規の冷凍機油が室内機側に流入するのを防止することができる。したがって、洗浄した冷媒中の異物と新規の冷凍機油（例えば、ＨＦＣ用冷凍機油）とが、混合することはなく、新規の冷凍機油が劣化しない。

【０１７８】請求項１７に記載の発明によれば、請求項１２の発明において、第２バイパス路の冷却手段の上流側に冷媒の油成分を分離する油分離手段を備えた。これにより、冷媒の加熱手段と冷却手段とにより、接続配管中の異物の洗浄効果をさらにあげるとともに異物の捕捉効果を上げ、かつ、油分離器により、新規の冷凍機油が室内機側に流入するのを防止できる。また、洗浄した冷媒中の異物と新規の冷凍機油（例えば、ＨＦＣ用冷凍機油）とが、混合することはなく、新規の冷凍機油が劣化しない。

【０１７９】請求項１８に記載の発明によれば、冷媒が室内機をバイパスする室内バイパス機を設けたので、室内機の両側に接続される接続配管を流れる冷媒の状態をほぼ同じにできるので、均一な洗浄運転が可能で、効果・手間が一定化する。また、残留異物が置換された新しい室内機に流入することがないので、新しい室内機の汚染を防ぐことができる。

【０１８０】請求項１９に記載の発明によれば、油分離手段により分離された油成分を異物捕捉手段より下流側でアキュムレータに戻す還流路を備えた。これにより、圧縮機から吐出された冷媒中の冷凍機油（例えば、ＨＦＣ用冷凍機油）を、冷媒から分離して、異物を捕捉された後の冷媒ともに圧縮機へ戻すので、冷凍機油が接続配管に残留していた鉱油と混ざることはなく、ＨＦＣ用冷凍機油はＨＦＣに対して非相溶化することはない。また、ＨＦＣ用冷凍機油が鉱油により劣化することはない。

【０１８１】請求項２０に記載の発明によれば、第２バイパス路の油分離手段の下流側に冷媒に鉱油を注入する鉱油注入手段を備えた。これにより、室内機に接続された接続配管に流入する冷媒に鉱油を注入することができるので、冷凍機油がスラッジ化した接続配管中の残留異物を、この鉱油に溶解させることで、洗浄し、異物捕捉手段で、捕捉することができる。

【０１８２】請求項２１に記載の発明によれば、第２バイパス路の油分離手段の下流側に冷媒に水を注入する水注入手段を備えた。これにより、室内機に接続された接続配管に流入する冷媒に水を注入することができるので、接続配管中の塩化鉄をイオン化させることで、洗浄し、異物捕捉手段で捕捉することができる。

【０１８３】請求項２２に記載の発明によれば、冷媒回路に冷媒中の水分を吸着する水分吸着手段を備えた。これにより、塩化鉄の洗浄のために注入して過飽和になった水分を吸着し低減させることができる。

【０１８４】請求項２３に記載の発明によれば、異物捕捉手段により、冷媒の流速を低下させて冷媒中の異物を分離するようにしたので、冷媒中の異物を分離することができる。

【０１８５】請求項２４に記載の発明によれば、異物捕捉手段において、冷媒を鉱油中に通すことにより、冷媒中の異物を捕捉することができる。

【０１８６】請求項２５に記載の発明によれば、異物捕捉手段において、冷媒を鉱油中に通すことにより、冷媒中のＣＦＣ及びＨＣＦＣを溶解し捕捉することができる。

【０１８７】請求項２６に記載の発明によれば、異物捕捉手段において、冷媒をフィルタに通すことにより、冷媒中の異物を捕捉することができる。

【０１８８】請求項２７に記載の発明によれば、異物捕捉手段において、冷媒をイオン交換樹脂に通すことにより、冷媒中の塩素イオンを捕捉することができる。

【０１８９】請求項２８に記載の発明によれば、第１バイパス路、第２バイパス路、及び第３バイパス路を冷媒回路から切り離し自在に設けた。これにより、異物捕捉

手段を含むバイパス路の部分を冷媒配管の本管と分離することができ、洗浄運転後はバイパス路を閉じて、通常運転をすることができる。したがって、洗浄運転中に捕捉した異物が、再び運転回路中に戻ることがない。また、異物捕捉手段を経由しないため、圧縮機の吸入圧力損失が小さく、能力の低下が小さい。また、バイパス路に油分離器と異物捕捉手段とを含んで洗浄機を構成した場合には、洗浄機の部分を、冷媒配管の本管と分離することができ、洗浄運転後は洗浄機を閉じて、通常運転をすることができる。さらに、洗浄機を冷凍サイクル装置の全体から切り離し、脱着可能に接続できるので、洗浄運転後に洗浄機取り外すことができる。

【０１９０】請求項２９～３１の発明によれば、ＣＦＣ冷媒やＨＣＦＣ冷媒で使用していた第１の接続配管と第２の接続配管を再利用し、第１の接続配管と第２の接続配管とに残留する鉱油、固形異物及び液体異物、残留異物等を、流入してきたＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたので、既設の接続配管から洗浄した冷媒中の鉱油、或いは固体異物と液体異物を十分に分離して捕捉することができる。気体異物は、冷媒が異物捕捉手段を何回か通るうちに捕捉することができる。

【０１９１】請求項３２に記載の発明によれば、（第１の冷媒）を用いる既存の冷凍サイクル装置において、機器を（第２の冷媒）を用いるものに置換し、既存の冷媒配管を用いて、上記の各発明の冷凍サイクル装置を形成することができる。これにより、既設の冷媒配管中の異物を捕捉し、新規の冷凍機油が既設の接続配管に流入しないようにして、熱源機と室内機のみを新規に交換し、熱源機と室内機とを接続する接続配管を交換しないで、老朽化した旧冷媒（例えば、ＣＦＣまたはＨＣＦＣ）を用いた冷凍サイクル装置を新しい冷媒（例えば、ＨＦＣ）を用いた冷凍サイクル装置に入れ替えることができる。また、接続配管を、専用の洗浄液で洗浄するということをしないので、オゾン層破壊の可能性は全く無く、また可燃性・毒性も皆無で、洗浄液残留の懸念も無く、洗浄液を回収する必要も無い。また、必要なＨＦＣや冷凍機油は必要最小限ですむのでコスト・環境上有利である。また、交換用冷凍機油の管理も不要で、かつ冷凍機油過不足の危険性も全く発生しない。また、ＨＦＣ用冷凍機油の非相溶化や冷凍機油の劣化の恐れも無い。

【０１９２】また、請求項３３または３４に記載の発明によれば、室外機に内蔵された冷媒配管に、ＣＦＣ冷媒やＨＣＦＣ冷媒で使用していた既設の接続配管に残留していた残留異物を、流入してきたＨＦＣ冷媒中から捕捉する異物捕捉手段を備えたので、既設の接続配管から洗浄したＨＦＣ冷媒中の固体異物と液体異物を十分に分離して捕捉することができる。また、気体異物は、ＨＦＣ冷媒が異物捕捉手段を何回か通るうちに捕捉することができる。

【０１９３】

【図面の簡単な説明】

【図１】　この発明の実施の形態１による冷凍サイクル装置の一例として、空気調和装置の冷媒回路を示す図。

【図２】　ＨＦＣ用冷凍機油に塩素が混入している場合（１７５℃）の劣化の時間変化を示す図で。

【図３】図３は異物捕捉手段１３の一例を図示したものである。

【図４】鉱油とＣＦＣとの溶解度曲線、及び鉱油とＨＣＦＣとの溶解度曲線を示す図。

【図５】　油分離器の構造を示す図。

【図６】　油分離器におけるガス冷媒の流速と分離効率の関係を示す図。

【図７】　この発明の実施の形態２による冷凍サイクル装置の一例として、空気調和装置の冷媒回路を示す図。

【図８】　この発明の実施の形態２による冷凍サイクル装置の通常空調運転の状態を示す図。

【図９】　この発明の実施の形態３による冷凍サイクル装置の一例として、空気調和装置の冷媒回路を示す図。

【図１０】　この発明の実施の形態３による冷凍サイクル装置の通常空調運転の状態を示す図。

【図１１】　従来のセパレート形の空気調和装置の冷媒回路を示す図。

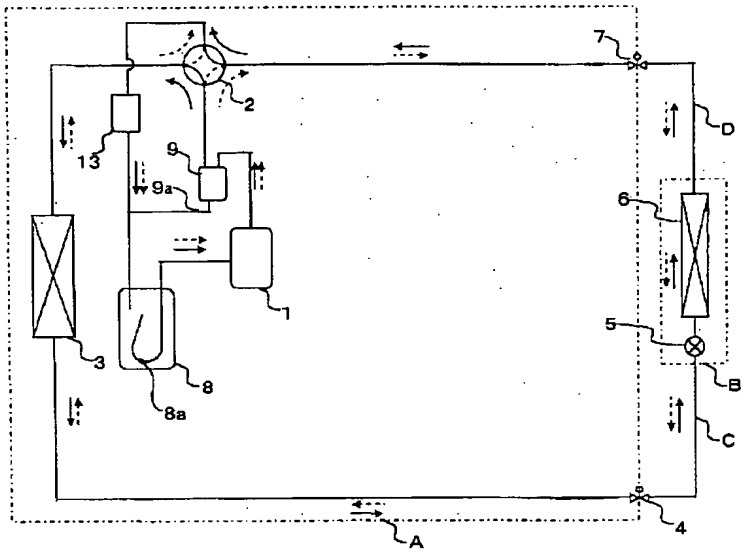
【図１２】　鉱油混入時のＨＦＣ用冷凍機油とＨＦＣ冷媒との溶解性を示す臨界溶解度曲線を示す図。

【図１３】　従来の空気調和装置の洗浄方法を説明する図。

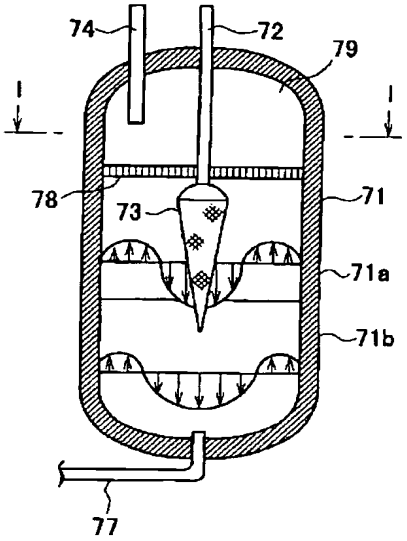
【符号の説明】

Ａ　熱源機、　Ｂ　室内機、　Ｃ　第１の接続配管、　Ｄ　第２の接続配管、Ｅ　洗浄機、　ＣＣ　第３の接続配管、　ＤＤ　第４の接続配管、　１　圧縮機１、　２　四方弁２、　３　熱源機側熱交換器、　４　第１の操作弁、　５流量調整器、　６　利用側熱交換器、　７　第２の操作弁、　８　アキュムレータ、　９　油分離器、　１０　第１の切換弁、　１１　第２の切換弁、　１２ａ　冷却手段、　１２ｂ　加熱手段、　１３　異物捕捉手段、　１４ａ～１４ｄ第１～第４の電磁弁、　１５　第１の流量制御手段、　１６　第２の流量制御手段、　１７ａ～１７ｆ　第３～第８の操作弁、　１８ａ～１８ｃ　第５～第７の電磁弁、　５１　容器、　５２　流出配管、　５３　フィルタ、　５４　鉱油、　５５　流入配管、　５６　イオン交換樹脂。

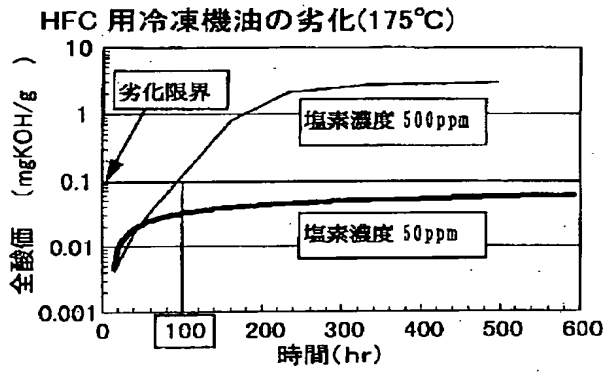
【図１】


7
2
13
9
9a
D
6
1
5
3
8
8a
B
C
4
A

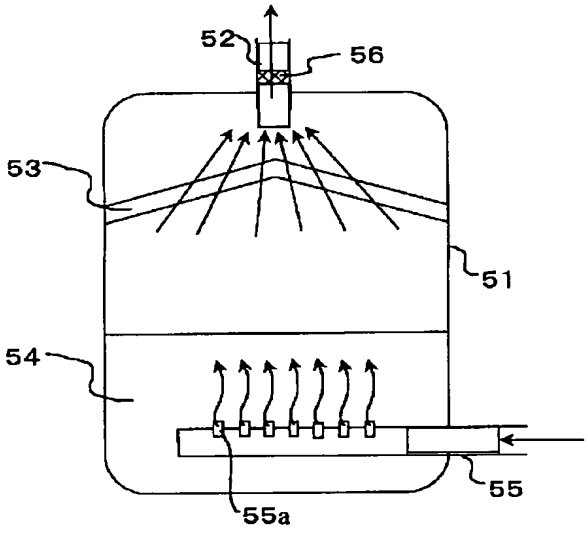
【図５】


74
72
79
78
73
71
71a
71b
77

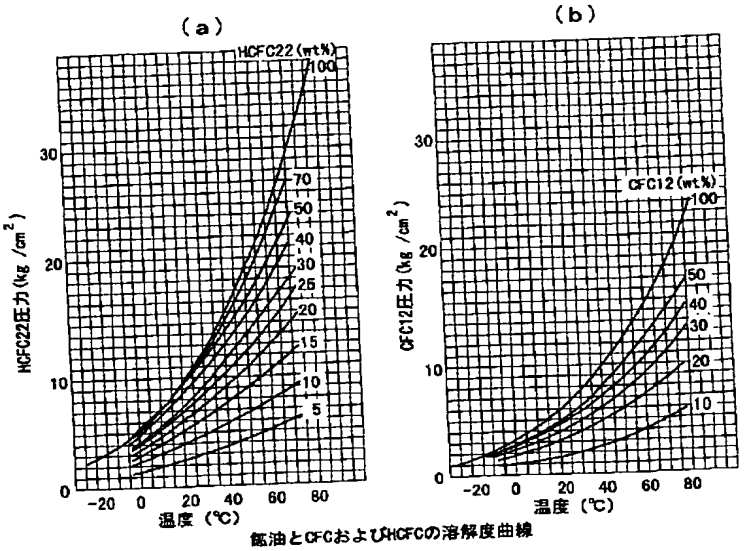
【図２】


HFC 用冷凍機油の劣化(175℃)
全酸価（mgKOH/g）
10
1
0.1
0.01
0.001
劣化限界
塩素濃度 500ppm
塩素濃度 50ppm
0
100
200
300
400
500
600
時間(hr)

【図３】

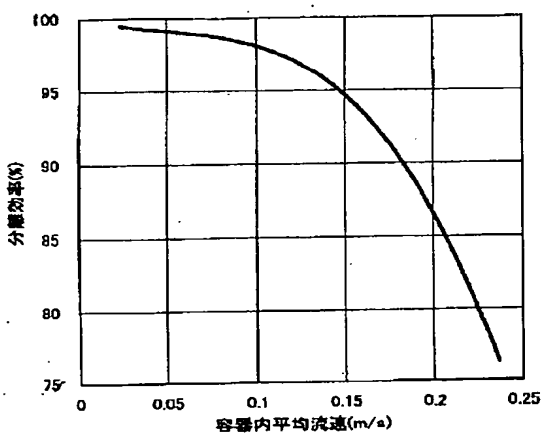

52
56
53
51
54
55
55a

【図４】



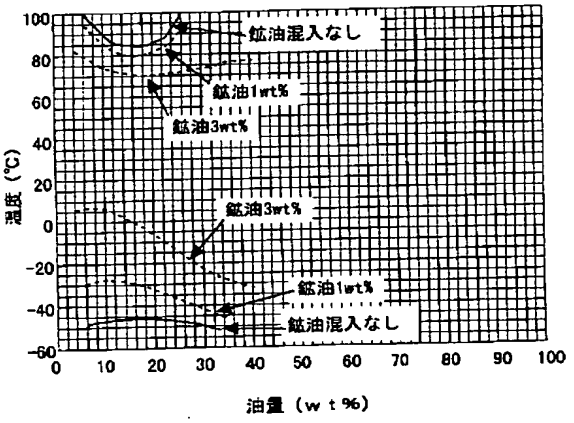
鉱油とCFCおよびHCFCの溶解度曲線

【図６】



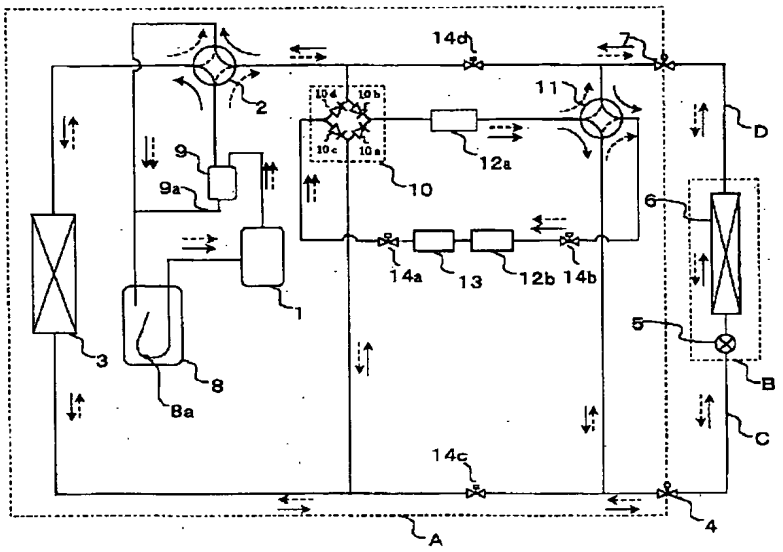
油分離器のガス流速と分離効率の関係

【図１２】

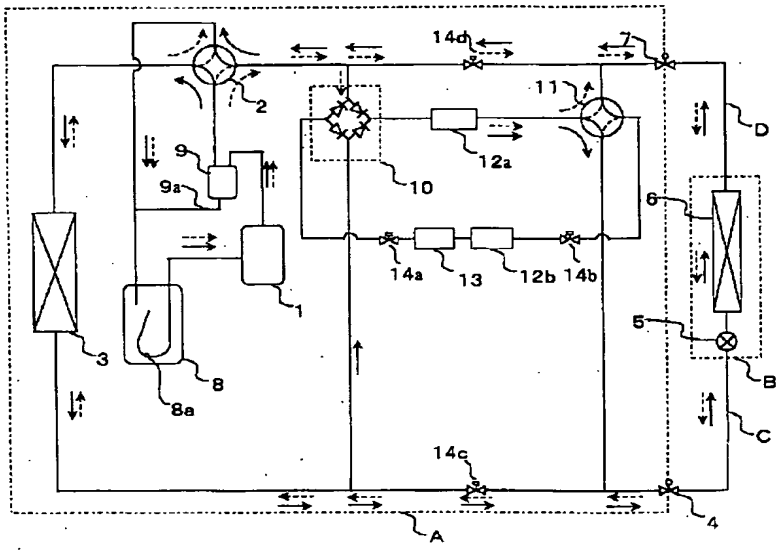


鉱油混入時のHFC用冷凍機油とへHFC冷媒(R407C)との溶解性
(臨界溶解度曲線)

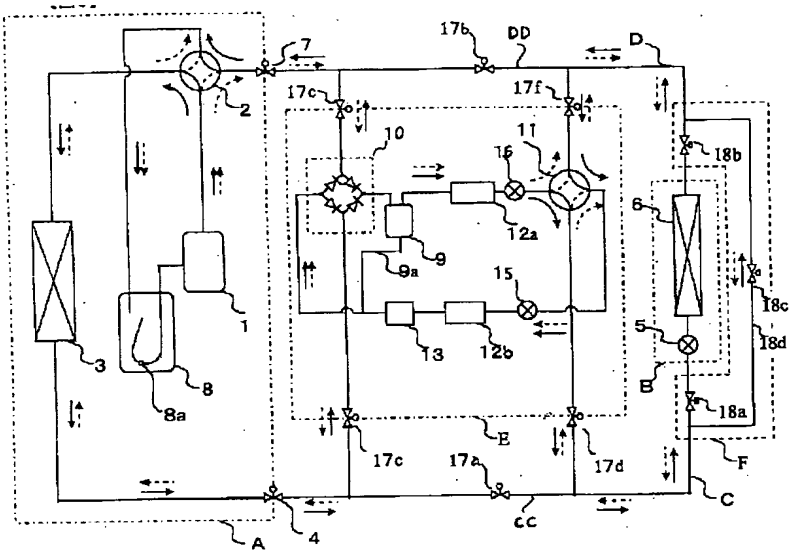
【図７】


14d
7
2
11
D
10d
10b
10c
10a
9
12a
9a
10
6
14a
13
12b
14b
5
3
1
B
8
8a
C
14c
4
A

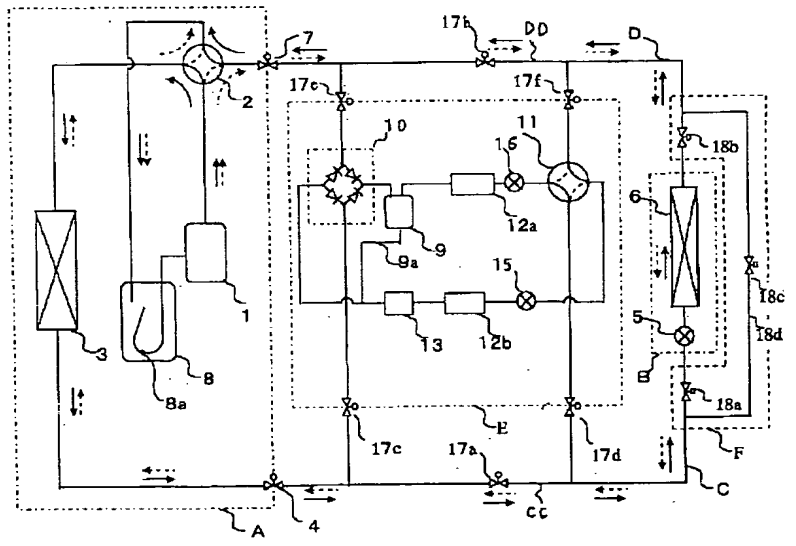
【図８】


14d
7
2
11
D
9
12a
9a
10
6
14a
13
12b
14b
5
3
1
B
8
8a
C
14c
4
A

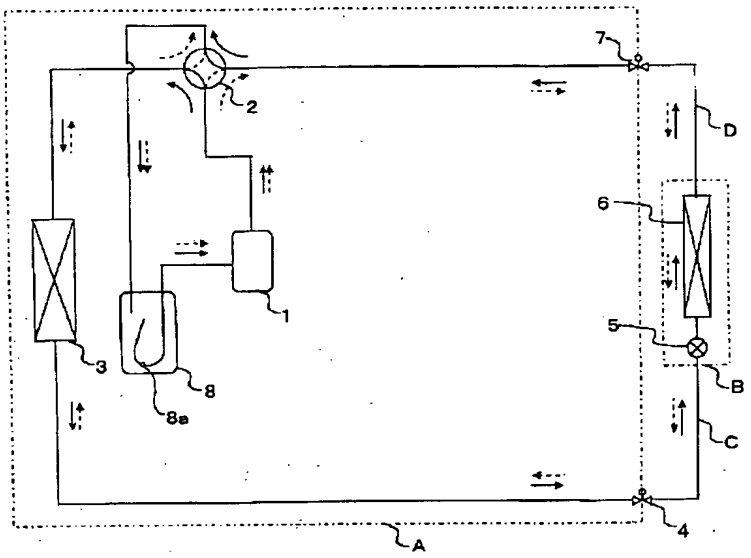
【図９】


17b
DD
D
7
2
17c
17f
10
11
16
18b
12a
9
9a
6
15
18c
5
18d
13
12b
B
18a
E
17c
17a
17d
F
C
cc
A
4
1
3
8
8a

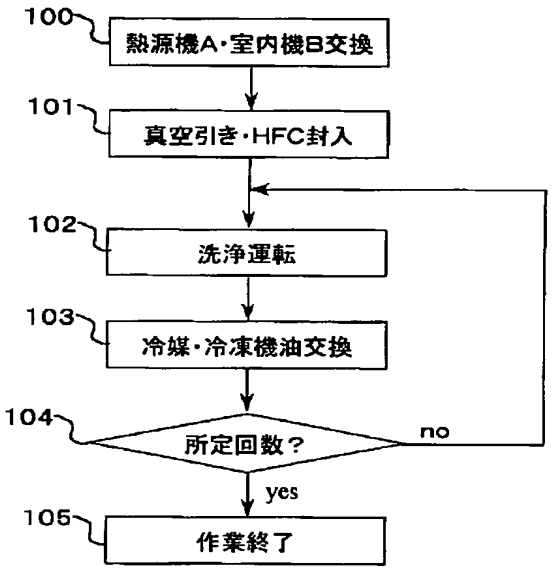
【図１０】


17b
DD
D
7
2
17c
17f
10
11
16
18b
12a
9
9a
6
15
18c
5
18d
13
12b
B
18a
E
17c
17a
17d
F
C
cc
A
4
1
3
8
8a

【図１１】


7
2
D
6
1
5
3
8
B
8a
C
4
A

【図１３】


100
熱源機A・室内機B交換
101
真空引き・HFC封入
102
洗浄運転
103
冷媒・冷凍機油交換
104
所定回数？
no
yes
105
作業終了

フロントページの続き

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特開 昭58－130967（ＪＰ，Ａ）
特開 平５－5580（ＪＰ，Ａ）
特開 平９－196518（ＪＰ，Ａ）
特開 平７－110179（ＪＰ，Ａ）
特開 平８－86519（ＪＰ，Ａ）

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F25B 43/00 - 47/00
F25B 1/00